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ILLUSTRATED ENCYCLOPÆDIA

OF THE

SCIENCE AND PRACTICE

OF

OBSTETRICS.

WITH

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EDITED BY

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EDITOR'S PREFACE.

NOTHING is more important to the obstetrician than to be prepared to meet the emergencies and difficulties that constantly arise in the lying-in room, and for the treatment of which there is then no time to consult authorities. It goes without saying that in no way can the mal-positions of labor be so indelibly fixed in the mind as by the careful study of correctly drawn anatomical plates. Once familiar with, the mind always retains these impressions. This is particularly the case when these plates are accompanied with a full description and explanation of the conditions and positions represented by them.

The fact that in America there are so few opportunities for practical instruction in this branch, and that the young practitioner is left almost entirely dependent upon his text-books, has induced the publisher to select from Moreau and other authors, and to prepare for the profession at very great expense the most elaborate set of plates ever presented to the student of Obstetrics.

That the student may find within this work all the instruction he will require to become a thorough and skilled obstetrician, the Editor, recognizing the fact that no author is equally strong on all branches of his subject, has concluded to select from various authors their ablest and fullest contributions, thus making the work an exhaustive Obstetrical Encyclopædia. Inclosed in brackets will be found such additions as in the judgment of the Editor were required to fully adapt the work to the wants of the American practitioner. The selections have been made from the latest foreign editions, except that from Cazeaux, which is by permission from the translation of P. Blakiston, Son & Co., Philadelphia.

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1432 *Spruce Street.*

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PLATE I.

BONES OF THE ADULT FEMALE PELVIS.

Sacrum.

Fig. 1, Anterior face.
Fig. 2, Posterior face.
Fig. 3, Lateral border.
Fig. 4, Base.
From a^1 to a^5, Fig. 1, The five false vertebræ or pieces forming the sacrum.
From b^1 to b^4, Fig. 1, The four ridges formed by the union of these pieces.
From c^1 to c^4, Fig. 1, The four anterior sacral foramina on each side, analogous to inter-vertebral.
d, Figs. 1, 3, 4, The surface of articulation for the last lumbar vertebra.
e, Figs. 1, 2, 3, 4, The oblique or articulating processes.
f, Figs. 1, 3, Apex of the sacrum articulating with the base of the coccyx.
From g^1 to g^4, Fig. 2, The spine of the sacrum formed by the union of four spinous processes.
From h^1 to h^4, Fig. 2, The posterior sacral foramina.
i, Fig. 2, and *j*, Fig. 4, The superior opening of the canal for the cauda equina.
j, Fig. 2, The inferior orifice of the same canal.
k, *k*, Figs. 2, 3, Cornua of the sacrum formed by the splitting of the last spinous process.
l, Fig. 3, Sacro-iliac articular surface.
m, *m*, Fig. 2, Gutter on each side of spine.

Coccyx.

Fig. 5, Posterior face.
1, 2. 3, 4, The four pieces which compose the coccyx.
a, *a*, The cornua of the coccyx.
b, *b*, Tubercles, rudiments of transverse processes.

Innominatum.

Fig. 6, 7, External or femoral aspect.
Fig. 8, Internal or pelvic aspect.
a, Figs. 6, 7, Dorsum of the ilium.
From *b* to *c*, Figs. 6, 7, 8, Crista of the ilium.
From *b* to *d*, Figs. 6, 7, 8, Depression between the anterior spinous processes of the ilium.
From *c* to *e*, Figs. 6, 7, 8, Space between the two posterior spinous processes.
From *e* to *f*, Figs. 7, 8, Great sciatic notch.
From *f* to *g*, Figs. 7, 8, Trochlea for the tendon of the obturator internus, called small sciatic notch.
From *g* to *h*, Figs. 6, 7, 8, The tuberosity of the ischium.
From *h* to *j*, Figs. 6, 8, The ramus of the ischium.
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From *k* to *p*, Figs. 6, 8, Body and horizontal portion of the pubes.
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c, Figs. 6, 7, 8, Posterior superior spinous process.
d, Figs. 6, 8, Anterior inferior spinous process.
e, Figs. 6, 7, 8, Posterior inferior spinous process.
f, Figs. 7, 8, Spine of the ischium.
g, *h*, Figs. 6, 7, 8, Tuberosity of the ischium.
j, Figs. 6, 8, Junction of the rami of the pubes and ischium.
k, Figs. 6, 8, Angle of the pubes.
l, Figs. 6, 8, Spine of the pubes.
m, Figs. 6, 8, Symphysis of the pubes.
n, Figs. 6, 8, Obturator or thyroid foramen.
o, Figs. 6, 7, Acetabulum.
p, Figs. 6, 8, Linea ilio-pectinea.
q, Fig. 8, Anterior border of the ilium.
r, Fig. 8, Costa or venter of the ilium.
s, Fig. 8, Articulating surface for the sacrum.
t, Fig. 8, Groove for the obturator vessels and nerves.

Fig 1

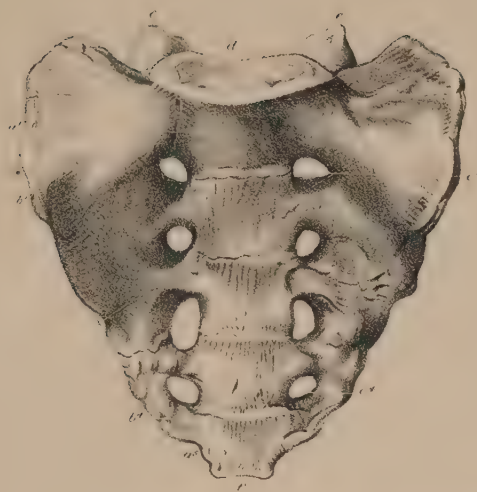

Fig 2

Fig 5

Fig 7

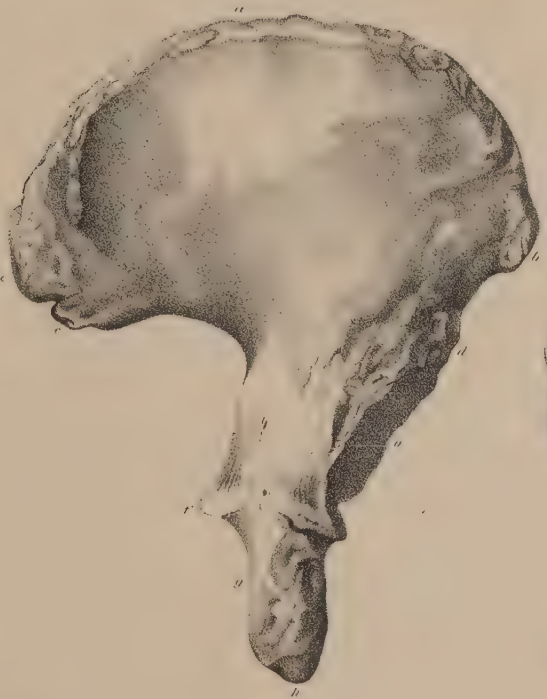

Fig 3

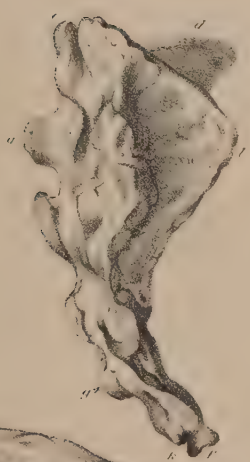

Fig 4

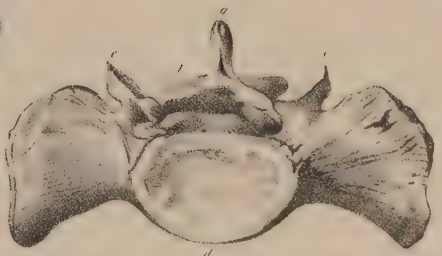

Fig 6

Fig 8

PLATE II.

DIFFERENCES OF THE PELVIS FROM SEX AND AGE.

Fig. 1, Pelvis of an adult male.
Fig. 2, Pelvis of an adult female.
Fig. 3, Pelvis of a fœtus at term.

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a, Anterior face of the sacrum.
b, Venter of the ilium.
c, Posterior superior spinous process.
d, Anterior superior spinous process.
e, Anterior inferior spinous process.
f, Spine of the ischium.
g, Acetabulum.
h, Tuberosity of the ischium.
i to *j*, Arch of the pubes.
k, Thyroid foramen.
l, Spine of the pubes.
m, Linea ilio-pectinea.
n, Symphysis pubis.
o, Sacro-iliac junction.
p, Promontory of the sacrum or sacro-vertebral angle.
q, Superior strait.
r, The two last lumbar vertebræ.
s^1, s^2, Transverse processes.

References to Figure 3.

a, a^1, Points of ossification of the bodies of the sacral vertebræ.
b, b^1, Points of the lateral masses.
c, Venter of the ilium ossified.
d, Body of the pubes ossified.
e, Body of the ischium ossified.
f, Crista of the ilium yet cartilaginous.
g, Acetabulum cartilaginous.
h, Symphysis pubis very wide.
i, The two last lumbar vertebræ.

Fig 1

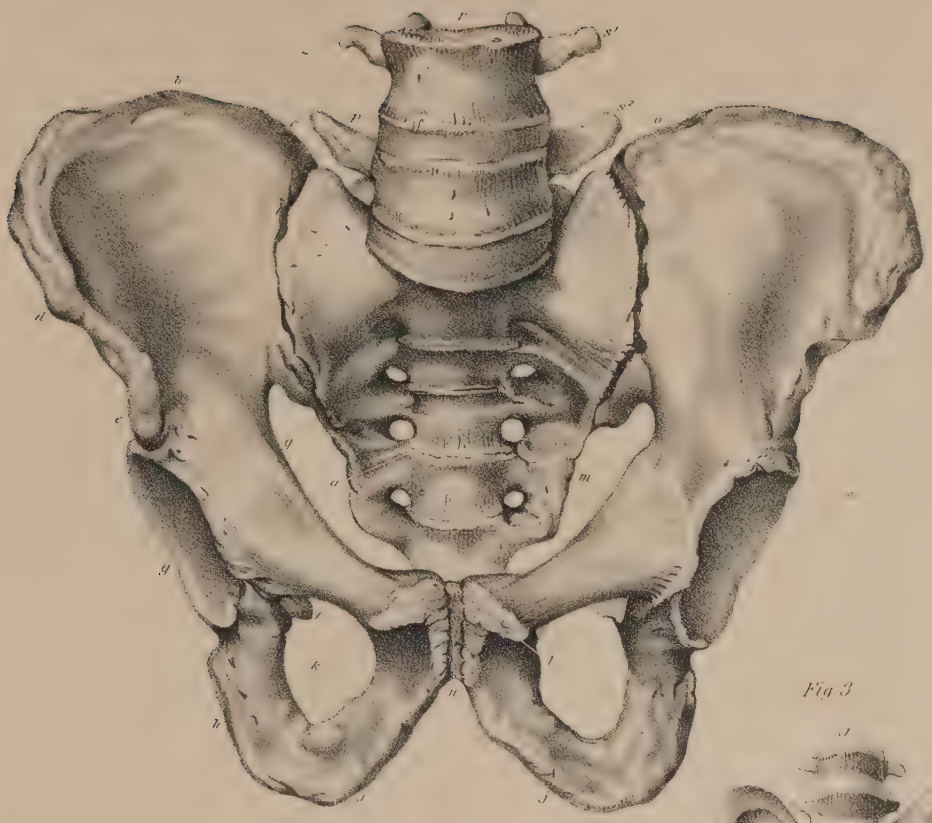


Fig 3

Fig 2

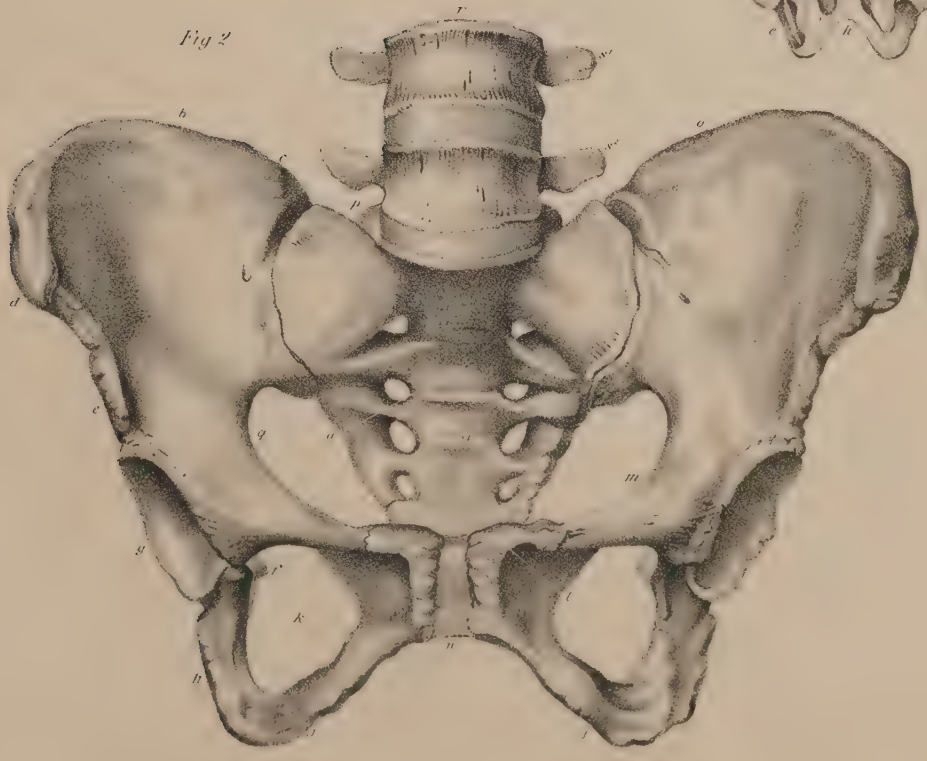


PLATE III.

VIEW OF THE SUMMIT AND BASE OF AN ADULT FEMALE PELVIS.

Fig. 1, Greater pelvis, articulations and abdominal strait.
Fig. 2, Perineal, or inferior strait.
Fig. 3, Outline of superior strait and diameters.
Fig. 4, Outline of inferior strait (Chaussier's plan).

References to Figures 1 *and* 2.

a, Anterior face of sacrum.
b, Point of coccyx.
c, Venter of the ilium.
d, Posterior superior spinous process of ilium.
e, Anterior superior spinous process of ilium.
f, Anterior inferior spinous process of ilium.
g, Horizontal position of the pubes.
h, Tuberosity of the ischium.
i, Acetabulum.
j, Foramen thyroideum.
k, Spine of the ischium.
l, The two last lumbar vertebræ.
m, Transverse process of fourth lumbar vertebra.
n, Transverse process of fifth lumbar vertebra.
o, Superior or greater sacro-sciatic notch, transmitting the pyriformis muscle, the sciatic nerve, and the gluteal and ischiatic vessels and nerves.
p, The inferior or lesser sacro-sciatic notch transmitting the obturator internus tendon and the internal pudic vessels and nerves.
q, Intervertebral cartilage, forming the sacro-vertebral angle.

1, Symphysis pubis.
2, Sacro-iliac symphysis and anterior and superior sacro-iliac ligaments.
3, Sacro-coccygeal symphysis.
4, Inferior or sub-pubic ligament.
5, Sacro-lumbar ligament.
6, Ilio-lumbar ligament.
7, Sacro-spinous ligament.
8, Intervertebral substance.
9, Greater or posterior sacro-sciatic ligament.
10, Lesser or anterior sacro-sciatic ligament.

References to Figure 3.

SUPERIOR STRAIT.

A, *B*, Antero-posterior diameter, four inches.
C, *D*, Transverse or bis-iliac diameter, five inches.
E, *F*, Oblique diameters, four and a half inches.

References to Figure 4.

INFERIOR STRAIT.

A, *B*, Antero-posterior or coccy-pubal diameter, four inches.
C, *D*, Transverse or bis-ischiatic diameter, four inches.
E, *F*, Oblique diameters, four inches.

Fig 1

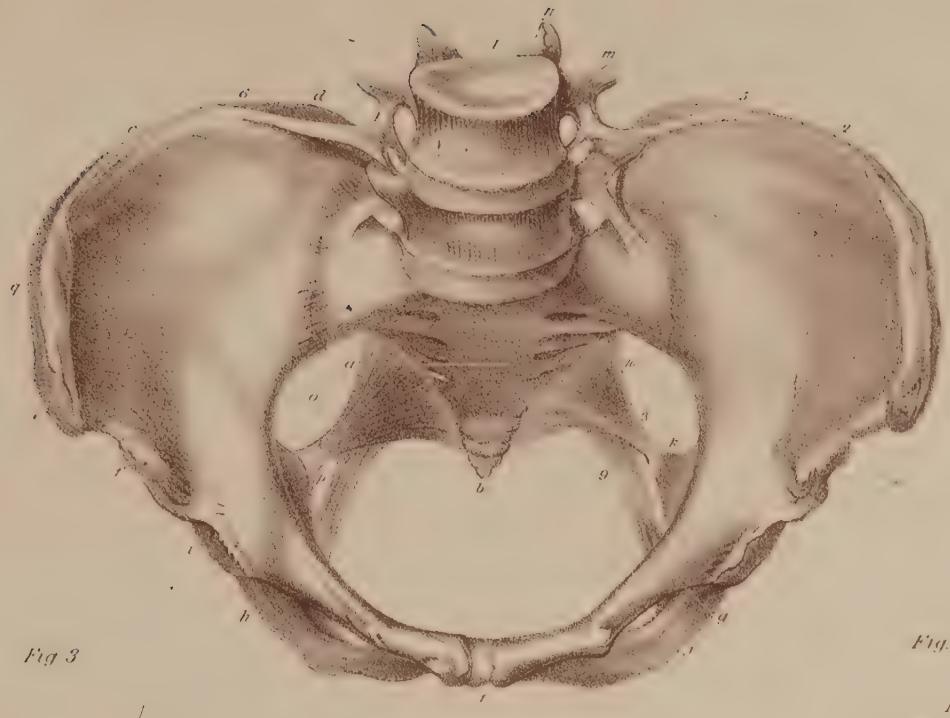


Fig 3

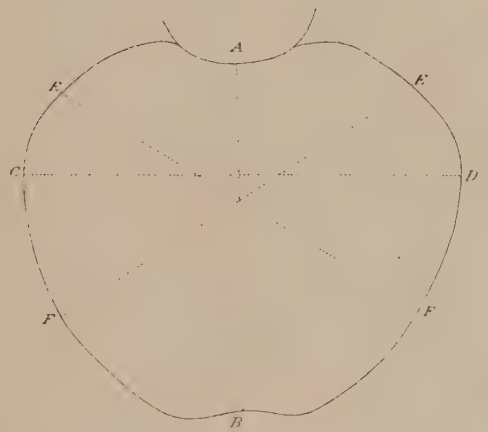


Fig. 4

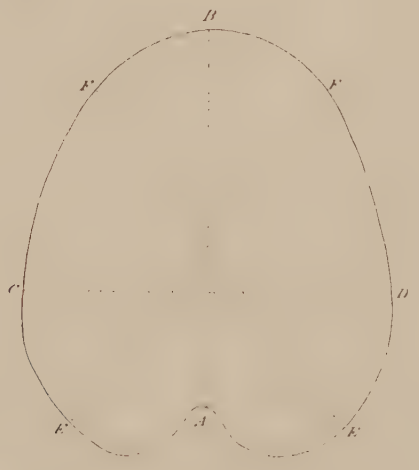


Fig. 2.

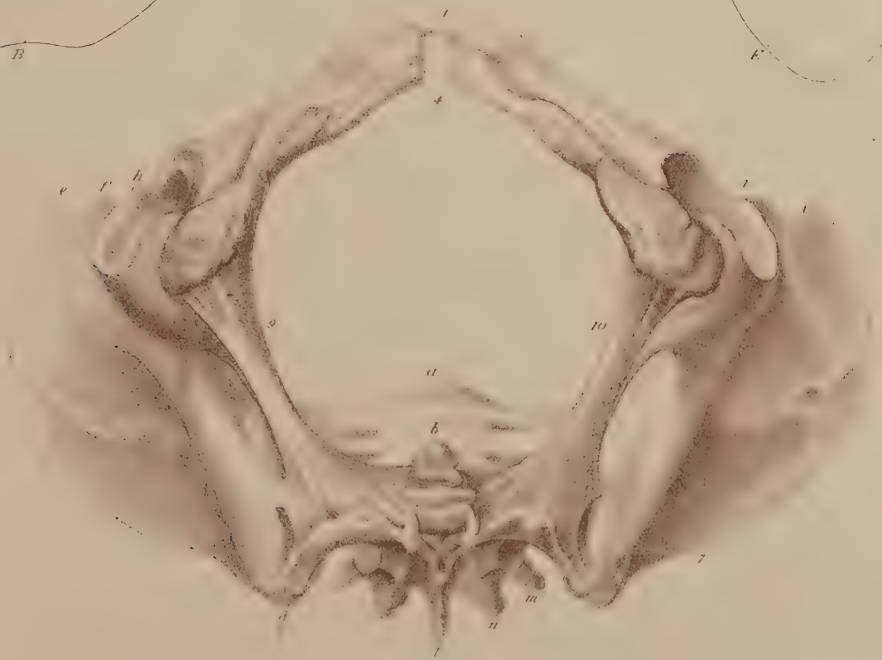


PLATE IV.

SECTIONS OF THE PELVIS TO EXHIBIT THE FORM, DIRECTION AND EXTENT OF THE PELVIC EXCAVATION.

Figures 1 and 2 are cut through the bis-iliac diameter, whilst 3 and 4 are divided in the course of the antero-posterior. Both are vertical sections.
Fig. 1, Posterior half of an adult female pelvis.
Fig. 2, Anterior half of the same pelvis.
Fig. 3, Right half of adult female pelvis.
Fig. 4, Outline of left half of same pelvis, showing diameters.

References to Figures 1, 2 *and* 3.

a, Anterior face of sacrum.
b, Point of coccyx.
c, Crista of the ilium.
d, Tuberosity of the ischium.
e, Acetabulum.
f, The two last lumbar vertebræ.
g, Spine of the ischium.
h, Greater sacro-sciatic notch.
i, Lesser sacro-sciatic notch.
l, Canal for the cauda equina.
m, Opening for the obturator vessels and nerves.
1, Ilio-lumbar ligament.
2, Sacro-vertebral ligament.
3, Anterior or lesser sacro-sciatic ligament.
4, Posterior or greater sacro-sciatic ligament.
5, Anterior sacro-coccygeal ligament.
6, Sacro-iliac symphysis.
7, Sacro-vertebral angle.
8, Inter-vertebral substance.
9, Symphysis pubis.
10, Sub-pubic ligament.
11, Obturator ligament.
12, Posterior inclined plane.
13, Anterior inclined plane.

References to Figure 4.

A, *B*, Sacro-pubic diameter, four inches.
C, *D*, Coccy-pubic diameter, four inches.
E, *F*, Antero-posterior diameter of the pelvis, measured from the most concave part of the sacrum to the back of the pubes, four inches eight lines.
G, *H*, Height of the pubes, eighteen lines.
I, *J*, Thickness of the symphysis, six lines.
K, *L*, Thickness of the sacrum at its base, two and a half inches.
M, *N*, Whole height of the pelvis measured from the middle of the iliac crest to the tuberosity of the ischium, seven inches.
O, *P*, Height of the sacrum, four inches.
Q, *R*, Length of the coccyx, one inch.
S, *T*, From the symphysis pubis to the end of the first spinous process of the sacrum, seven inches.

Fig 1

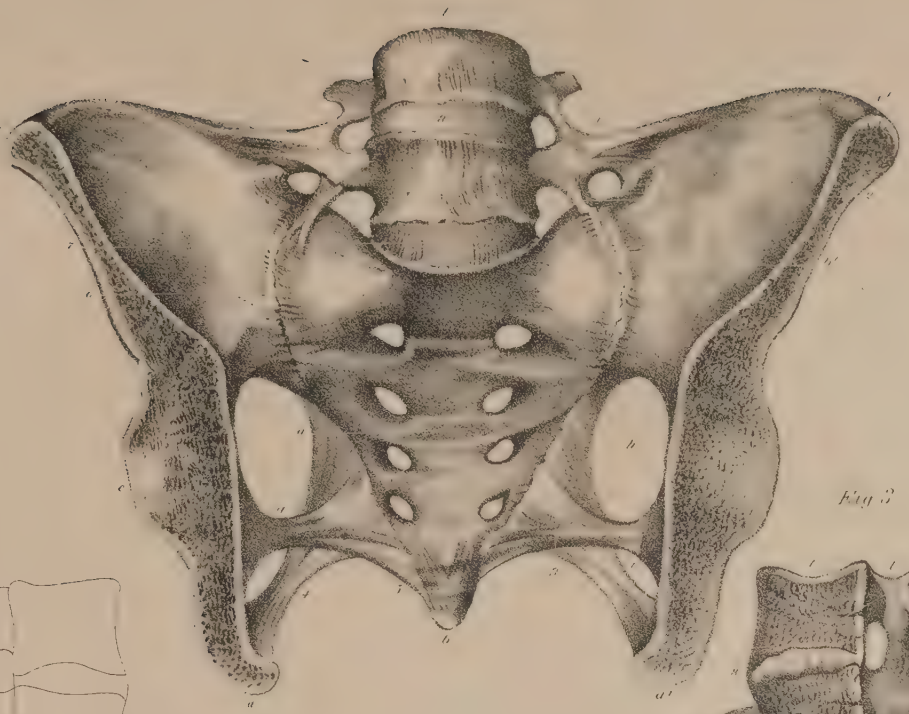


Fig 3

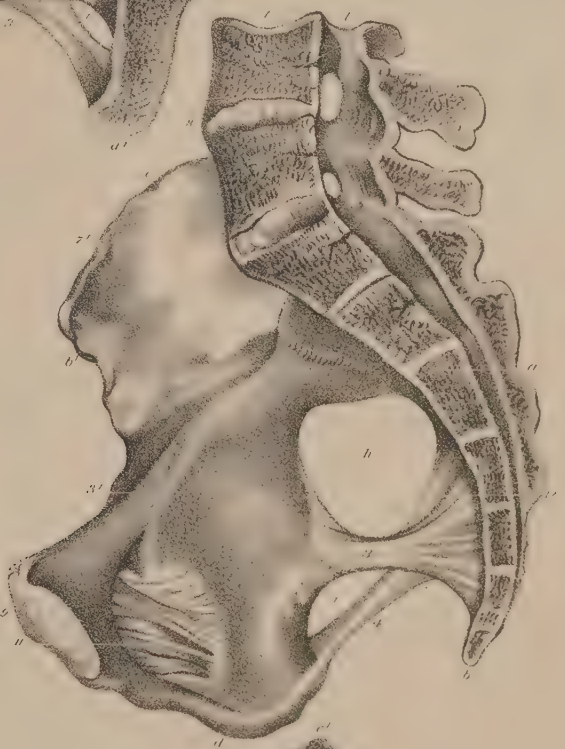


Fig 4

Fig 2

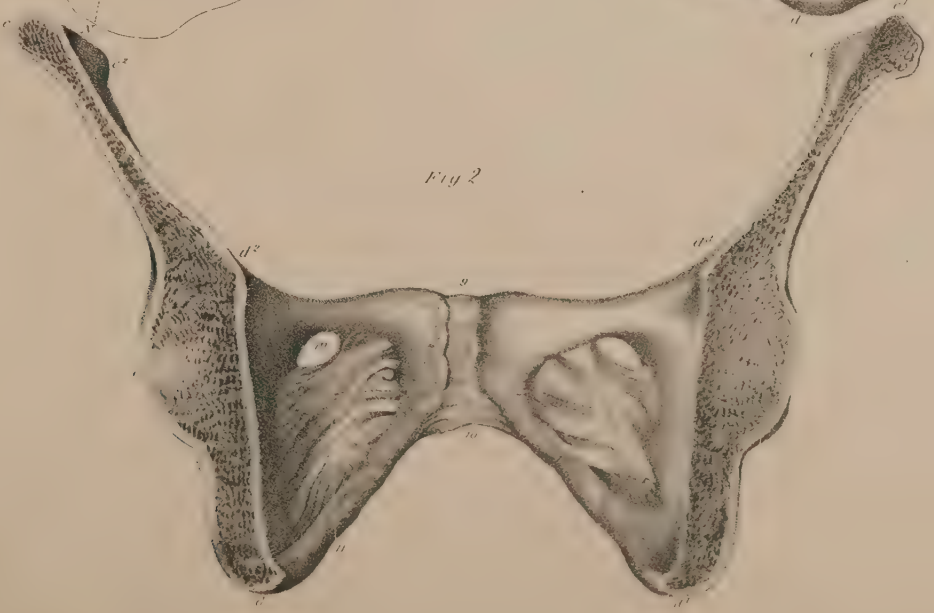


PLATE V.

DIRECTION AND AXES OF THE PELVIS.

a, *a*, Left portion of the lumbar region.
b, Left breech.
c, *c*, Internal and superior surface of the left thigh.
d, *d*, Section of the anterior paries of the abdomen, divided by the linea alba.
e, Anterior left thoracic region.
f, Umbilical cicatrix.
g, Bodies of the last dorsal vertebræ, sawn through their middle.
g^1, Spinous processes of the above-named vertebræ.
From h^1 to h^5, The five last lumbar vertebræ, divided through their middle.
k, Cauda equina.
l, Transversalis abdominis muscle.
m, Intercostal muscles.
n, Section of the parietes of the uterus.
o, Internal and left surface of the uterus.
p, Os uteri.
q, Sacro-vertebral angle.
A, *B*, Axis of the superior strait, forming with the axis of the body an angle of 49 degrees; the imaginary line representing it should pass two inches above the umbilicus, and two lines in front of the coccyx: it is obtained by dropping a perpendicular line on the middle of the plane of the superior strait.
C, *D*, Axis of the inferior strait, parallel to the axis of the body.
E, Plane of the superior strait.
G, *F*, Plane of the inferior strait: it is parallel to the horizon, and the line representing it passes immediately under the arch of the pubes, and over the summit of the coccyx.
H, Antero-posterior diameter of the cavity of the pelvis.
J, Circle of Carus, described around the symphysis pubis, taking as a centre the middle of the symphysis itself, at the point of termination of the antero-posterior diameter of the excavation, and as a radius the half of this diameter. The points of intersection of the circle with the diameters of the straits and of the excavation meet at the middle of these diameters: the portion of the circle passing over the pelvis indicates the direction followed by the fœtus whilst traversing the pelvic excavation.

PLATE VI.

MALFORMATION OF THE PELVIS.

Fig. 1, Pelvis malformed from excess of size, belonging to M. A. C. Baudelocque, seen from its base.

Fig. 2, Pelvis malformed from want of size, No. 5 in the collection of the Lying-in Hospital of Paris, seen from its base.

Fig. 3, Outline of the circumference of the superior strait of Fig. 1.
A, *B*, Antero-posterior diameter, four inches eight lines.
C, *D*, Transverse diameter, five inches nine lines.
E, *F*, Oblique diameters, five inches.

Fig. 4, Outline of the inferior strait of Fig. 1.
A, *B*, Coccy-pubal diameter, five inches.
C, *D*, Bis-ischiatic diameter, four inches nine lines.
E, *F*, Oblique diameters, five inches.

Fig. 5, Outline of the superior strait of Fig. 2.
A, *B*, Antero-posterior diameter, three inches.
C, *D*, Transverse diameter, four inches.
E, *F*, Oblique diameters, three inches eight lines.

Fig. 6, Outline of the inferior strait of Fig. 2.
A, *B*, Coccy-pubal diameter, two inches nine lines.
C, *D*, Bis-ischiatic diameter, three inches nine lines.
E, *F*, Oblique diameters, three inches seven lines.

Fig. 1.

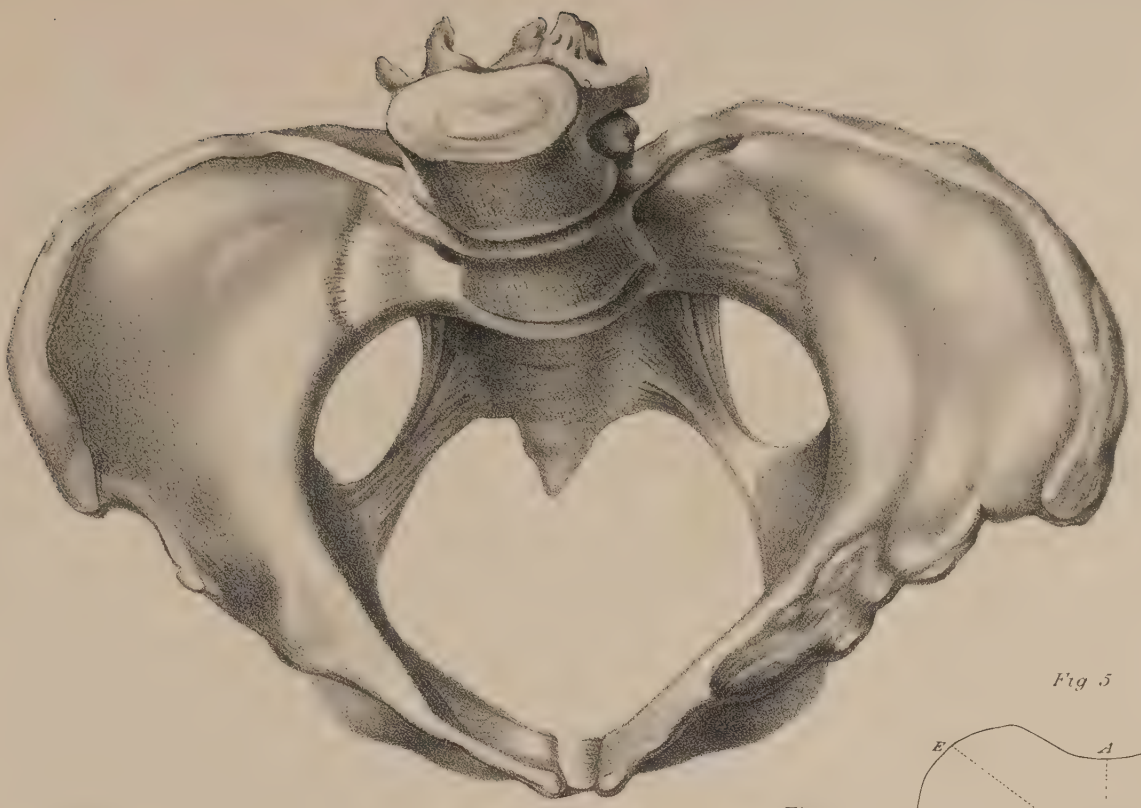


Fig. 3.

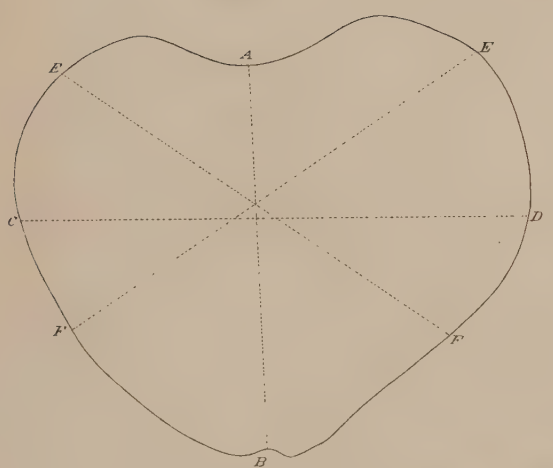


Fig. 4

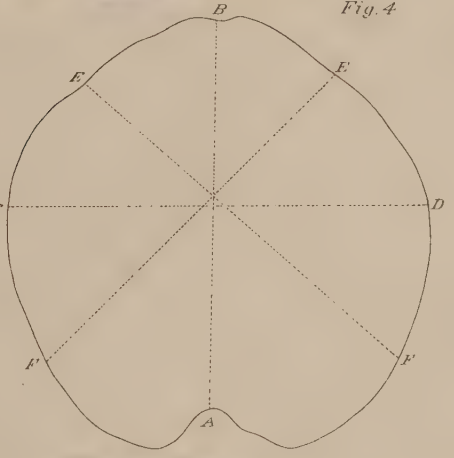


Fig. 5

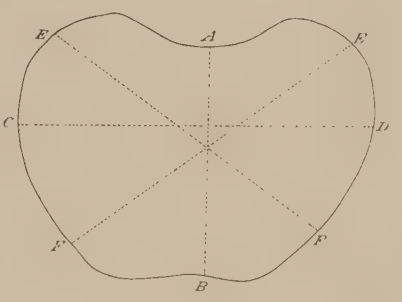
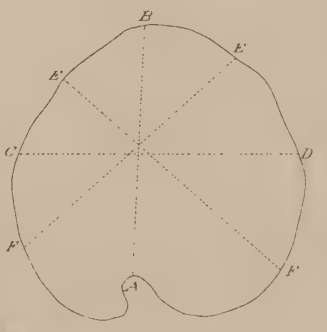


Fig. 6



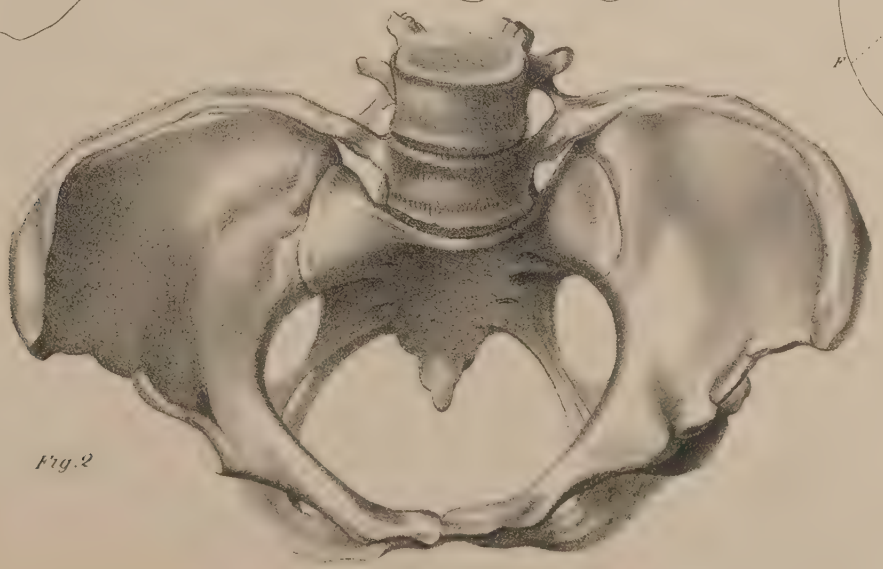


Fig. 2

PLATE VII.

MALFORMATION OF THE PELVIS.

Independently of an actual narrowness of its superior strait, the pelvis, figured in this Plate, is flattened as if it had been compressed between two planes acting, one from above downward and from behind forward, and the other from below upward and from in front backward; the sacrum is straightened, its base projected forward, its vertex backward; the iliac bone is, as it were, bent from behind forward, on the level and above the great ischiatic notch. The effect of this flexion has been to carry forward and outward the tuberosities of the ischia, whence there results a contraction of the superior and an enlargement of the inferior strait.

Fig. 1, Pelvis, No. 10 in the collection of the Lying-in Hospital of Paris, seen from its base.

Fig. 2, The same, seen from its vertex.

Fig. 3, Section through the median line.

Fig. 4, Outline of the superior strait of Fig. 1.
A, *B*, Antero-posterior diameter, two inches four lines.
C, *D*, Transverse diameter, four inches.
E, *F*, Oblique diameters, three inches nine lines.

Fig. 5, Outline of the inferior strait of Fig. 2.
A, *B*, Coccy-pubal diameter, four inches seven lines.
C, *D*, Bis-ischiatic diameter, five inches.
E, *F*, Oblique diameters, four inches six lines.

Fig 1

Fig 3

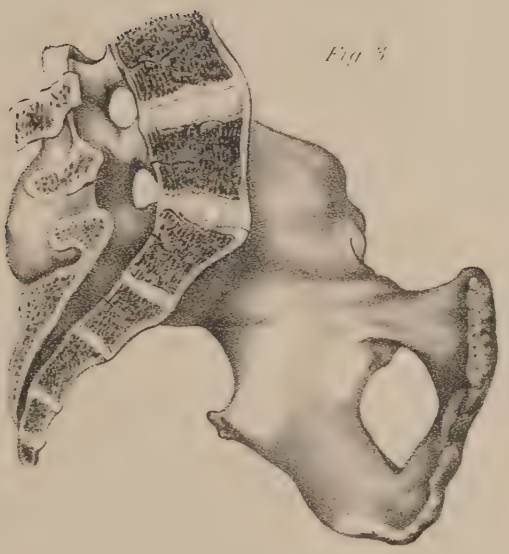


Fig 4

Fig 5

Fig 2

PLATE VIII.

MALFORMATION OF THE PELVIS.

In the Figures of this Plate the sacrum, at an inch and a half from its summit, is reflected forward in a horizontal direction; the coccyx, succeeding it, looks slightly upward, so as to present a deep excavation toward the inferior region of the sacrum; the horizontal branches of the pubes, for the extent of two inches, are parallel to each other, and, behind the symphysis, form a groove of five lines in breadth; the articular surfaces of the pubes curve inward to be united to each other. Viewed as a whole, this pelvis presents a lateral flattening; the arch of the pubes is very narrow; the ischia are approximated; there hence results a great excess of dimensions of the antero-posterior diameter.

Fig. 1, Pelvis, malformed in its totality, seen from the base. (Museum Dupuytren.)

Fig. 2, The same, seen from its summit.

Fig. 3, Anterior region of the pelvis of the two preceding figures.

Fig. 4, Outline of the superior strait of Fig. 1.
A, *B*, Antero-posterior diameter, four inches six lines.
C, *D*, Transverse diameter, three inches six lines.
E, *F*, Oblique diameters, three inches eight lines.

Fig. 5, Outline of the inferior strait of Fig. 2.
A, *B*, Antero-posterior diameter, three inches six lines.
C, *D*, Transverse diameter, two inches six lines.
E, *F*, Oblique diameters, three inches.

Fig. 1.

Fig. 3.

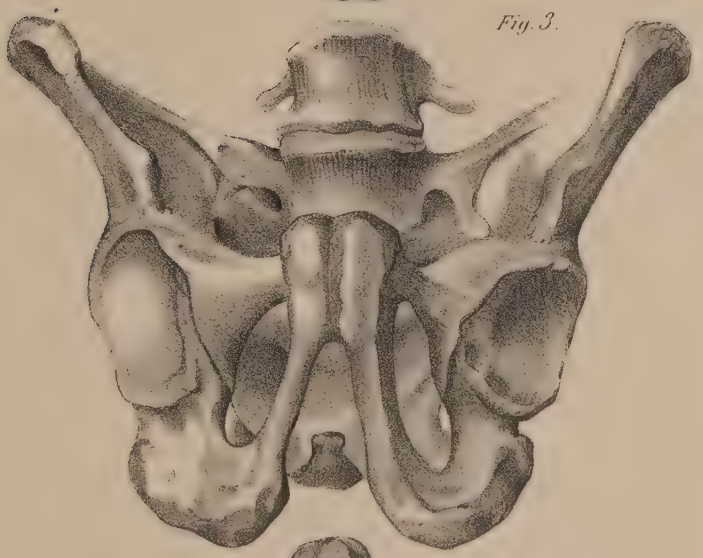


Fig. 4.

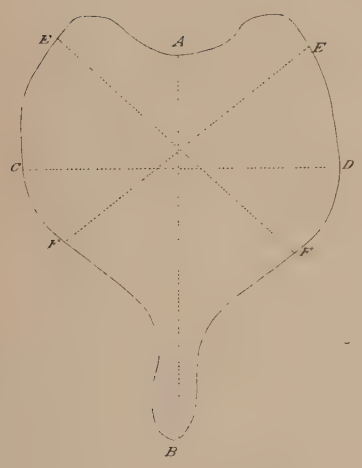


Fig. 5.

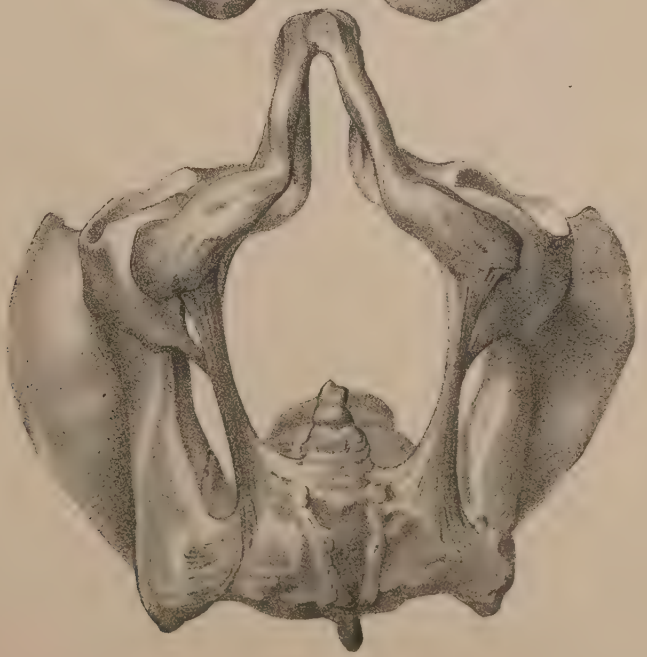


Fig. 2.

PLATE IX.

MALFORMATION OF THE PELVIS.

Fig. 1, Female pelvis, seen from its base. (Anatomical Collection of the Lying-in Hospital of Paris.)

It differs from the normal condition, because the symphysis pubis forms a projection forward, and a groove behind, resulting from the curvature anteriorly of the horizontal branch of the left pubes. Its dimensions are likewise universally defective.

Fig. 2, Outline of the superior strait of Fig. 1.
A, B, Antero-posterior diameter, three inches six lines.
C, D, Transverse diameter, four inches four lines.
E, F, Right oblique diameter, three inches nine lines.
E^1, F^1, Left oblique diameter, four inches.

Fig. 3, Outline of the inferior strait of Fig. 1.
A, B, Coccy-pubal diameter, two inches eight lines.
C, D, Transverse diameter, three inches.
E, F, Right oblique diameter, three inches.
E^1, F^1, Left oblique diameter, two inches eight lines.

Fig. 4, Female pelvis, seen from its base. (Anatomical Collection of the Lying-in Hospital of Paris.)

In this pelvis can be seen the consolidation of the left sacro-iliac articulation, without the possibility of discovering any traces of it: there are no osseous projections nor inequalities. The corresponding iliac fossa approaches very closely the middle of the sacrum: the base of this bone has lost all that part which is exterior to the first left sacral foramen, which is very much contracted at the point of union of the two bones. The deformity bears in a manner only on the left half of the pelvis, and the promontory of the sacrum, instead of corresponding to the symphysis pubis, corresponds to the left acetabulum.

Fig. 5, Outline of the superior strait of Fig. 4.
A, B, Antero-posterior diameter, four inches.
C, D, Transverse diameter, four inches three lines.
E, F, Right oblique diameter, two inches nine lines.
E^1, F^1, Left oblique diameter, four inches nine lines.

Fig. 6, Outline of the inferior strait of Fig. 4. The sacro-ischiatic ligaments are supposed to be restored.
A, B, Coccy-pubal diameter, four inches six lines.
C, D, Transverse diameter, three inches.
E, F, Right oblique diameter, four inches.
E^1, F^1, Left oblique diameter, two inches six lines.

Fig 1.

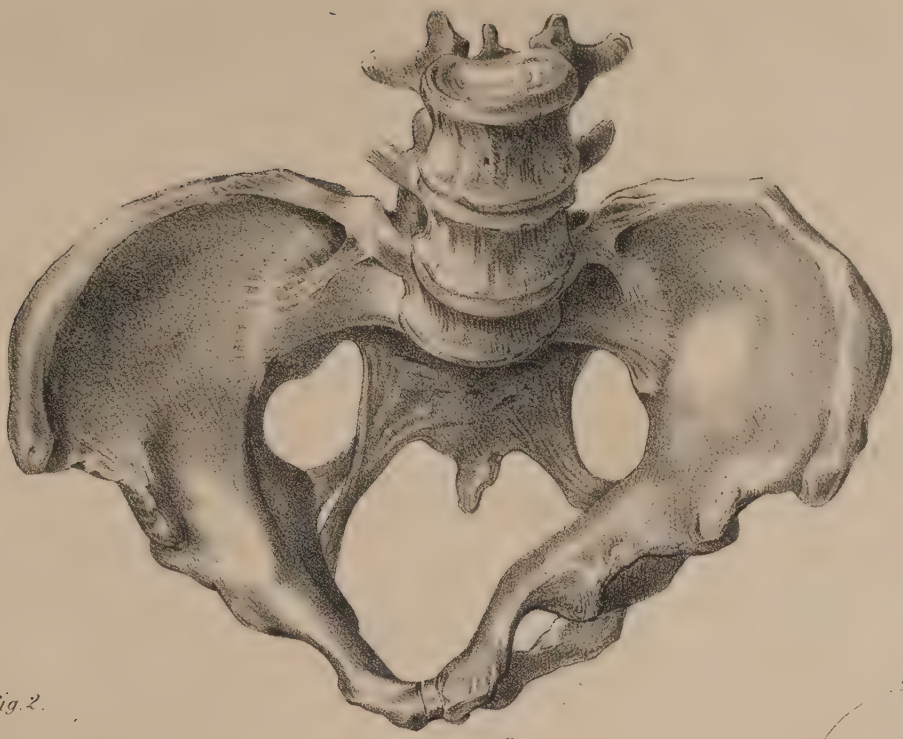
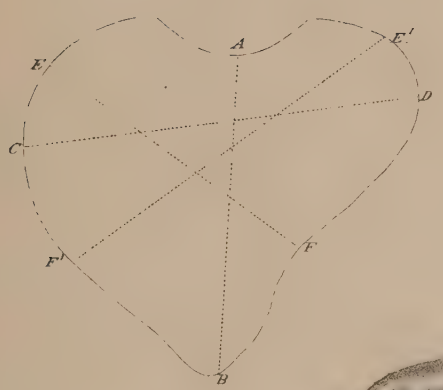


Fig 2.



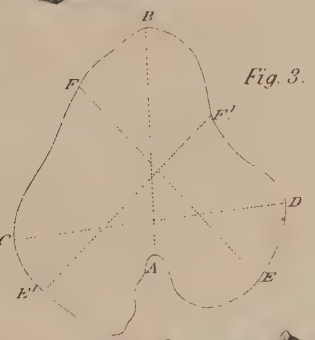


Fig 3.

Fig 5.

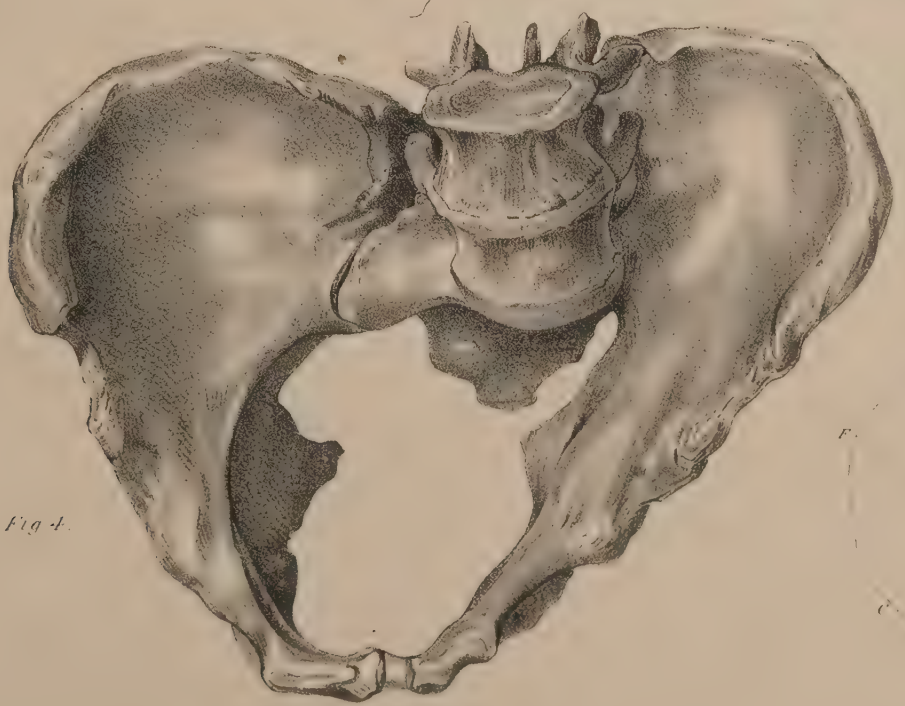


Fig 4.

Fig 6

PLATE X.

MALFORMATION OF THE PELVIS.

Fig. 1, Pelvis of a rachitic woman, seen from its base. (Anatomical Collection of the Lying-in Hospital of Paris.)

Fig. 2, The same pelvis, seen from its summit. In the skeleton from which this pelvis was taken, the femur, tibia and fibula were greatly curved; the vertebral column presented two enormous curvatures, one of which occupied the whole extent of the lumbar portion and the four last dorsal vertebræ, with its convexity turned to the left; the other, formed at the expense of the remainder of the dorsal portion, presented its convexity turned to the right: the ribs were also deformed, and the antero-posterior diameter of the thorax was much larger than natural.

The promontory of the sacrum projects considerably, on account of the great curvature of the sacrum. The fifth lumbar vertebræ projects greatly forward, and is separated from the right cotyloid paries only by a finger's breadth. The apex of the coccyx is only an inch and a half distant from the anterior part of the base of the sacrum.

The coxal bones have been doubly flexed forward and backward, in consequence of the crushing in of the two acetabula; consequently, the superior strait has assumed very nearly the shape of the heart on a playing-card.

Fig. 3, Outline of the superior strait of Fig. 1.
A, *B*, Antero-posterior diameter, two inches.
C, *D*, Transverse diameter, three inches nine lines.
E, *F*, Right oblique diameter, two inches ten lines.
E^1, F^1, Left oblique diameter, two inches nine lines.

Fig. 4, Outline of the inferior strait of Fig. 1.
A, *B*, Coccy-pubal diameter, two inches seven lines.
C, *D*, Transverse diameter, one inch ten lines.
E, *F*, Right oblique diameter, two inches three lines.
E^1, F^1, Left oblique diameter, two inches eight lines.

Fig. 5, Pelvis of a rachitic subject. (Museum Dupuytren.)

The sacrum is straight until within an inch of its summit; it is of normal width, and of inconsiderable thickness.

The body of the pubes and ascending rami of the ischia are very thin: the body of the pubes is only two lines in thickness. The infra-pubic foramina are very large; the left iliac portion approaches a vertical direction. The entire pelvis is greatly flattened from before backward.

The lumbar portion of the superincumbent vertebral column is carried nearly directly backward and slightly to the right.

Fig. 6, Outline of the circumference of the superior strait of Fig. 5.
A, *B*, Antero-posterior diameter, one inch eight lines.
C, *D*, Transverse diameter, five inches.
E, *F*, Right oblique diameter, four inches.
E^1, F^1, Left oblique diameter, four inches seven lines.

Fig. 7, Outline of the inferior strait of Fig. 5.
A, *B*, Coccy-pubal diameter, two inches.
C, *D*, Transverse diameter, five inches.
E, *F*, Right oblique diameter, three inches nine lines.
E^1, F^1, Left oblique diameter, four inches three lines.

Fig. 1.

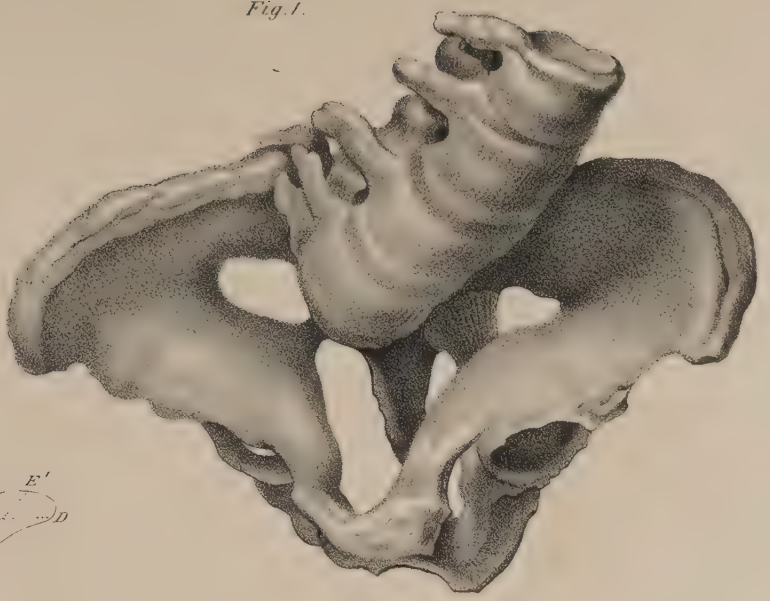


Fig. 3.

Fig. 4

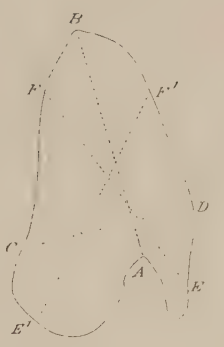


Fig. 5

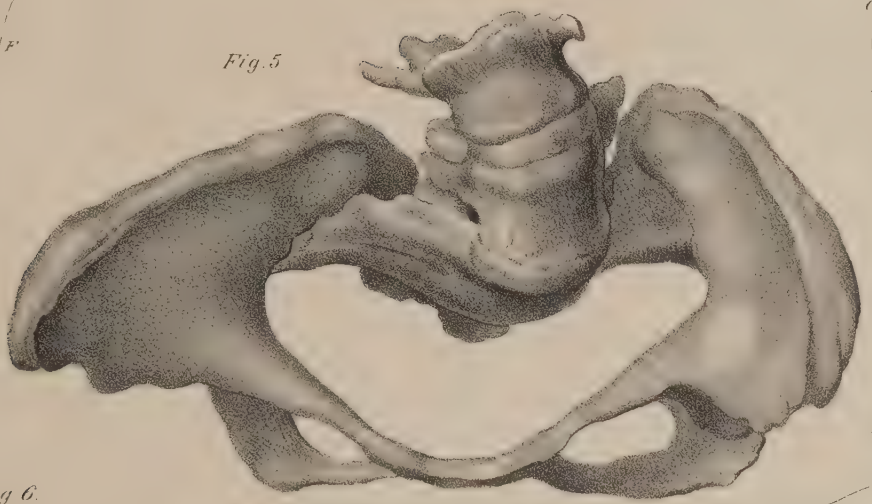


Fig. 6.

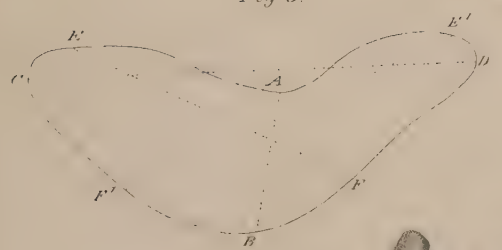


Fig. 7

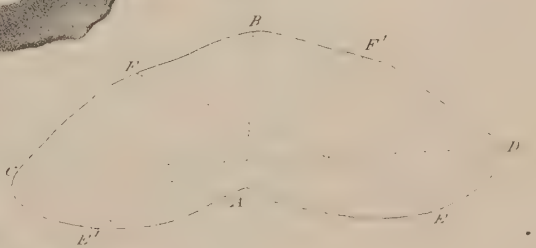


Fig. 2.

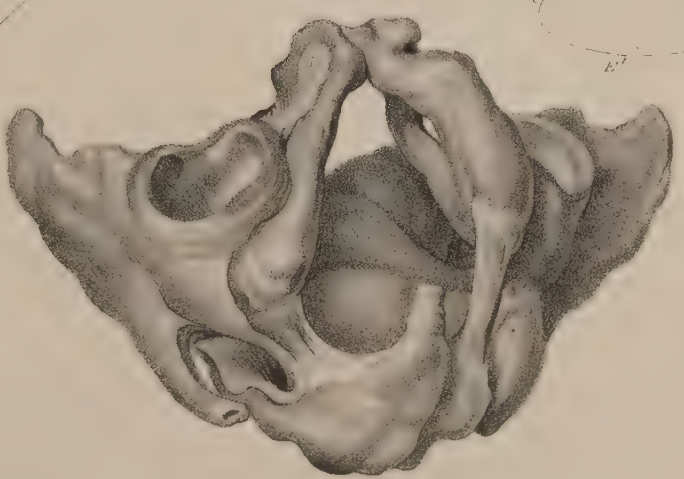


PLATE XI.

MALFORMATIONS OF THE PELVIS.

Fig. 1, Pelvis of a rachitic woman, belonging to the collection of M. Moreau, seen from the superior strait.

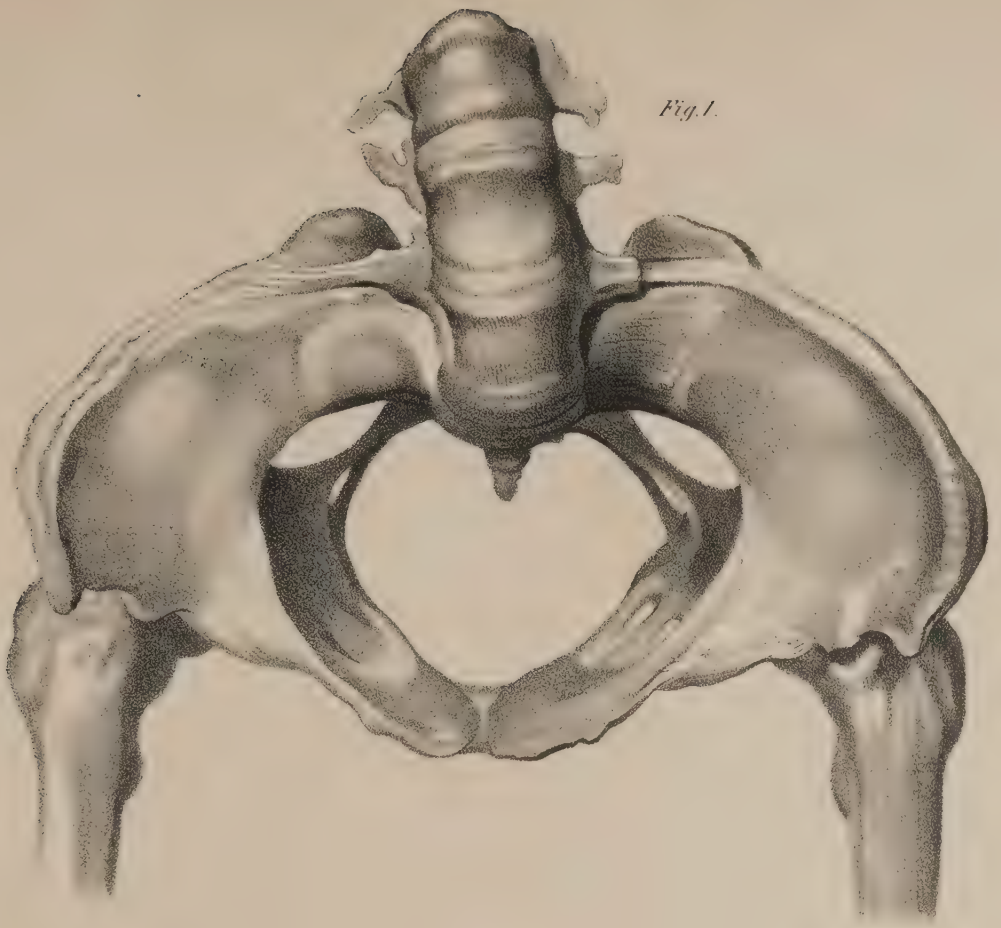
In this plate can be seen the direction of the pelvis in the living subject and in the erect position. The inclination forward is such that the anterior face of the sacrum looks directly downward; the direction of the cavity and its straits is nearly parallel to the horizon. The inferior strait is directly backward and slightly upward. The vertebral column appears to rest on the posterior face of the sacrum, owing to the change of direction of the articular surfaces. This pelvis presents a striking analogy to that of quadrupeds.

Fig. 2, The same pelvis, seen from the inferior strait. This figure, compared with the preceding, exhibits the disproportion which exists between the two straits; whilst the superior is evidently enlarged, the inferior strait is considerably contracted.

Fig. 3, Outline of the superior strait.
A, *B*, Antero-posterior diameter, five inches two lines.
C, *D*, Transverse diameter, five inches two lines.
E, *F*, Oblique diameters, four inches six lines.

Fig. 4, Outline of the inferior strait.
A, *B*, Coccy-pubal diameter, two inches six lines.
C, *D*, Transverse diameter, three inches eight lines.
E, *F*, Oblique diameters, three inches two lines.

Fig. 1.



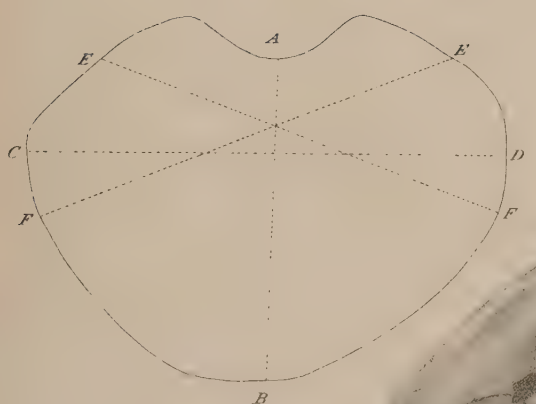


Fig. 3.

Fig 2.

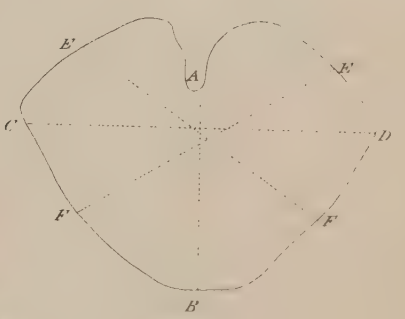


Fig. 4.

PLATE XII.

MALFORMATIONS OF THE PELVIS.

Fig. 1, Pelvis represented in Plate XIII., seen on its external surface.

Fig. 2, The same pelvis, sawed through its middle, and seen on its internal surface.

Fig. 3, Here another peculiarity of this very curious pelvis is seen, namely, that the sacrum, entirely straight, forms an inclined plane forward, whilst the pubes are directly backward and inward, whence there result two planes inclined in opposite directions, greatly separated above and approximated below, between which the head of the fœtus became more and more tightly wedged in proportion as it advanced.

Fig. 1.

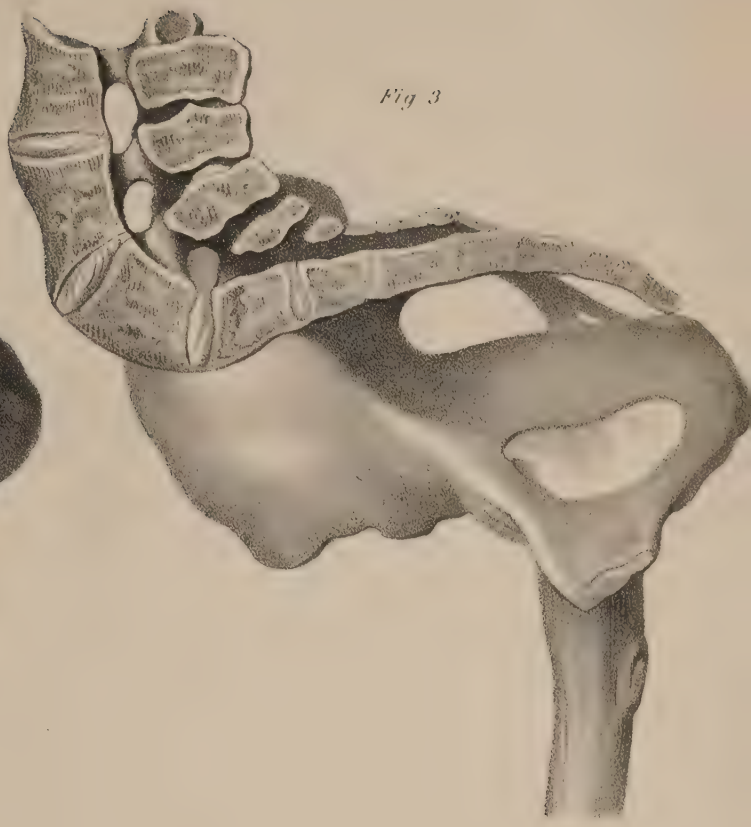


Fig 3

Fig 2.

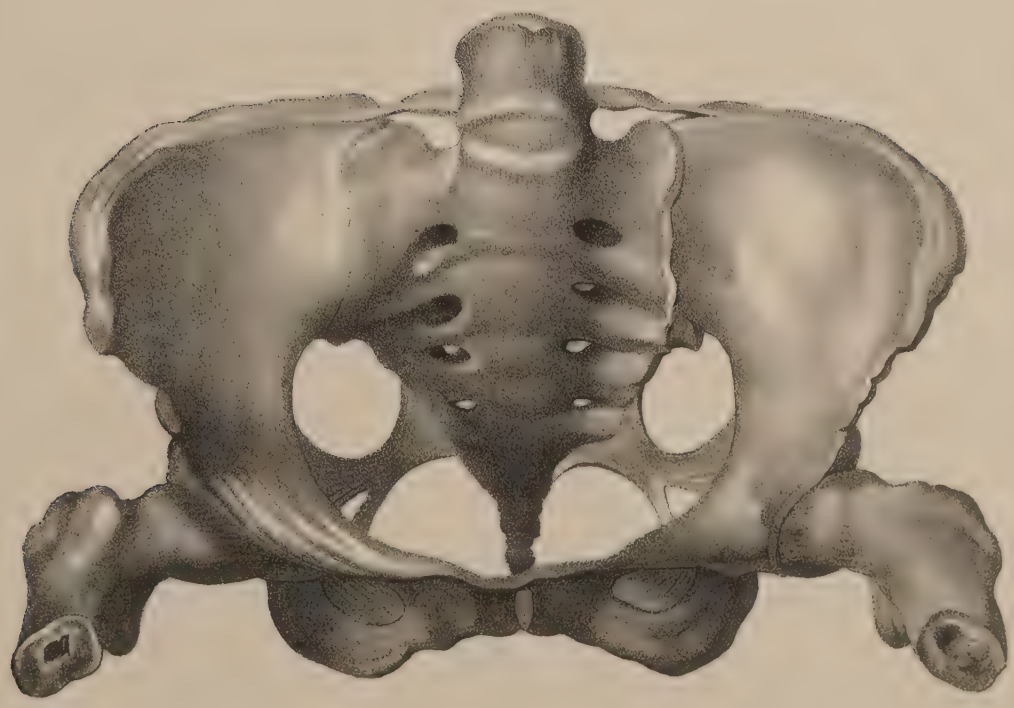


PLATE XIII.

PERINEUM OF AN ADULT WOMAN, SEEN FROM ITS INFERIOR SURFACE.

A, A, Superior and internal part of the thighs.
B, B, The breech.
C, C, Anterior paries of the abdomen.
D, Umbilicus.
E, Anterior commissure of the vulva.
F, Orifice of the anus.
G, G, Section of the labia pudendi at an inch from the anterior commissure.
H, Clitoris.
I, Root of the corpus cavernosum clitoridis.
J, Inferior orifice of the canal of the urethra.
K, Entrance of the vagina, through which is seen the bulbous portion of the anterior paries of this canal.
L, Section of the adipose tissue of the breech and integuments.
L[1] Section of the skin of the internal superior part of the thighs and breech.
M, Summit of the coccyx.
N, N, Tuberosities of the ischia.
O, O, Great sacro-sciatic ligaments.
P, Constrictor vaginæ muscle.
Q, Vulvar portion of the constrictor.
R, Erector clitoridis muscle.
S, Ischio-cavernosus muscle.
T, Transversalis perinæi muscle.
U, Sphincter ani muscle.
V, Levator ani muscle.
X, Gracilis muscle.
Y, Adductor magnus muscle.
Z, Z, Glutæi magni muscles.
a, Internal pudic artery and vein, after their passage between the sacro-sciatic ligaments.
b, b, Superior branch of the internal pudic artery.
c, Inferior or perineal branch of the same artery.
d, Inferior hæmorrhoidal arteries.
e, Branches of the pudic vein, forming a kind of plexus in front of the transversalis muscle.
f, Vaginal venous plexus.
g, Anastomotic, arterial and venous arches, placed at the root of the clitoris.
h, Trunk of the internal pudic nerve, after its passage between the sacro-sciatic ligaments.
i, Superficial or perineal branch of the internal pudic nerve.
j, Second superficial branch furnished here by the trunk of the pudic nerve, which is distributed to the labia pudendi.

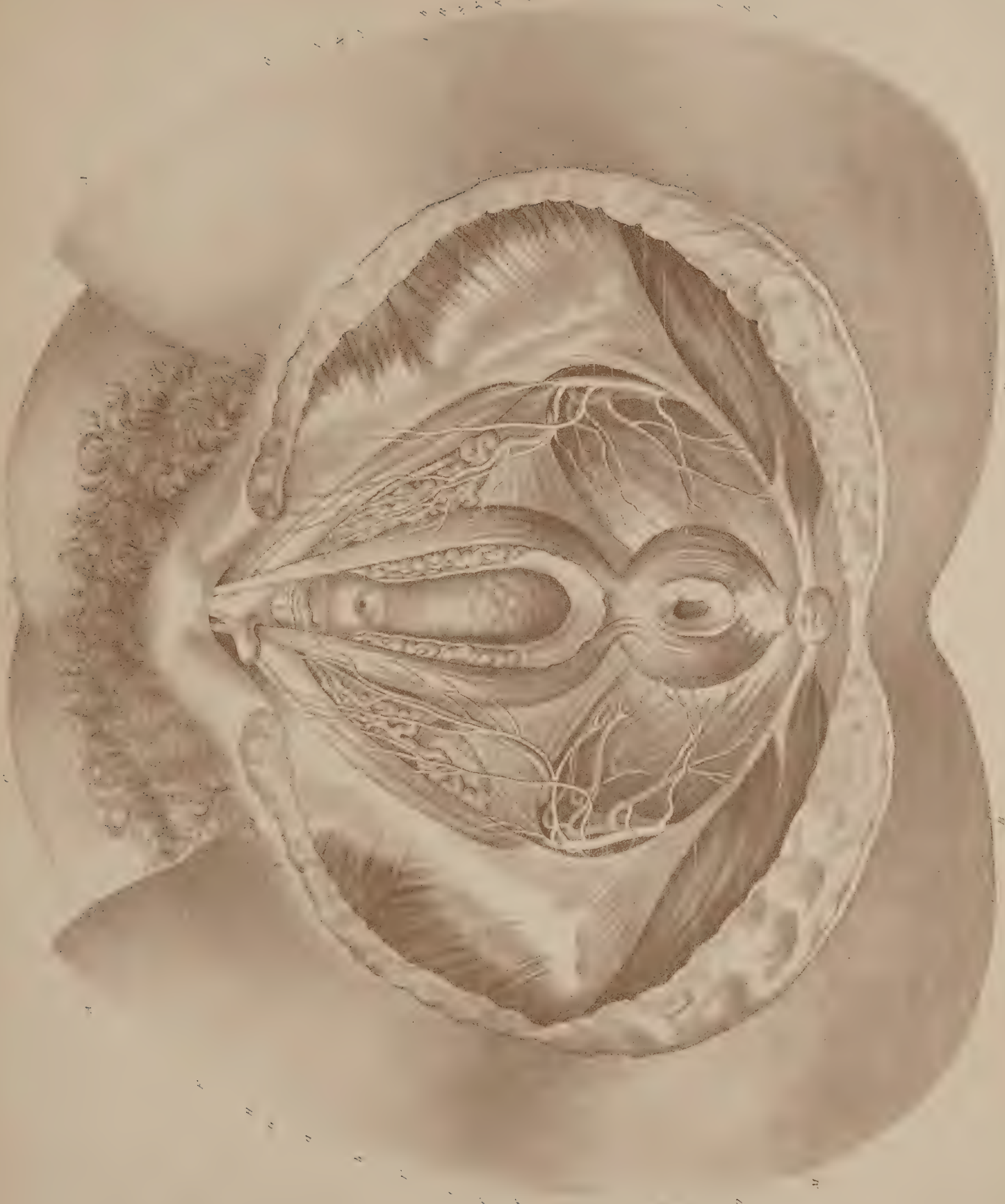


PLATE XIV.

THIS PLATE REPRESENTS THE ABDOMINAL PLANE OF THE PELVIS OF AN ADULT WOMAN, WITH THE SOFT PARTS COVERING IT, THE SUBJECT BEING ON HER BACK: THE PERITONEUM AND SUBJACENT APONEUROTIC LAMINÆ ARE REMOVED.

A, Coccyx.
A[1], Promontory of the sacrum.
B, Pubes.
C, *C*, Body of the pubes.
D, *D*, Recti muscles.
E, *E*, Parietes of the abdomen.
F, Obliquus externus abdominis muscle.
G, Obliquus internus abdominis muscle.
H, Transversalis abdominis muscle.
I, Ilio-lumbar ligament.
J, Psoas magnus muscle.
K, Psoas parvus muscle.
K[1], Aponeurosis of the psoas parvus muscle.
L, Iliacus internus muscle.
M, Obturator internus muscle.
N, Levator ani muscle.
O, Coccygeus muscle.
P, Aperture of the vagina.
Q, Superior orifice of the anus.
R, Vesical aperture of the urethra.
S, Round ligament of the uterus, divided.

1, Aorta.
2, Right primitive iliac artery.
3, External iliac artery.
4, Internal iliac artery.
5, Origin of the obturator and umbilical arteries.
6, Circumflex iliac artery and veins.
7, Vascular branches of the iliac fossa.
8, Inferior lumbar vessels.
9, Epigastric artery and veins.
10, Middle sacral arteries and veins.
11, Vena cava inferior.
12, Left primitive iliac vein.
13, External iliac vein.
14, Right internal iliac vein.
15, Obturator artery, given off in this subject by the epigastric.
16, Crural nerve.
17, 18, Musculo-cutaneous branches, furnished by the crural plexus.

PLATE XV.

SECTION OF AN ADULT FEMALE PELVIS, DIVIDED IN FRONT AT THE SYMPHYSIS PUBIS AND BEHIND AT THE LEFT SACRO-ILIAC JUNCTION.

A, Integuments of the abdomen.
B, Adipose tissue, forming the mons veneris.
C, Labium major.
D, Labium minor.
E, Clitoris.
F, Urethra.
G, Perineal portion of the vagina.
H, Anus and lower part of the rectum.
I, Lesser sacro-sciatic ligament.
J, Round ligament of the uterus.
K, Symphysis pubis, covered with its cartilage.
L, Sacro-iliac junction or symphysis.
M, Promontory of the sacrum.
N, Internal face of the transversalis abdominis muscle.
N^1, Sheath of the rectus muscle.
N^2, Fascia transversalis.
O, Rectus abdominis muscle.
P, Psoas magnus muscle.
Q, Iliacus internus muscle.
R, Obturator internus muscle.
S, Origin of the pyriformis muscle.
T^1, Levator ani muscle.
T^2, Pelvic aponeurosis.
U, Coccygeus muscle.

1, Aorta.
2, Origin of the inferior mesenteric artery.
3, Right primitive iliac artery.
4, Right external iliac artery.
5, Circumflex iliac artery and veins.
6, Epigastric artery and veins.
7, Internal iliac artery.
8, Gluteal artery.
9, Internal pudic artery.
10, Ischiatic artery.
11, Remains of the umbilical artery, giving off the vesical arteries.
12, Uterine artery.
13, Obturator artery.
14, Middle hæmorrhoidal artery.
15, Lateral sacral artery.
16, Middle sacral artery and veins.
17, Vena cava ascendens.
18, External iliac vein.
19, Internal iliac vein.
20, Ischiatic vein.
21, Gluteal vein.
22, Internal pudic veins.
23, Obturator vein.
24, Muscular veins.
25, Lateral sacral veins.

a, *b*, Abdomino-crural nerves.
c, External cutaneous nerve.
d, Anterior crural nerve.
e^1, Spermaticus externus nerve.
e, *f*, *g*, Sacral plexus.
h, Obturator nerve.

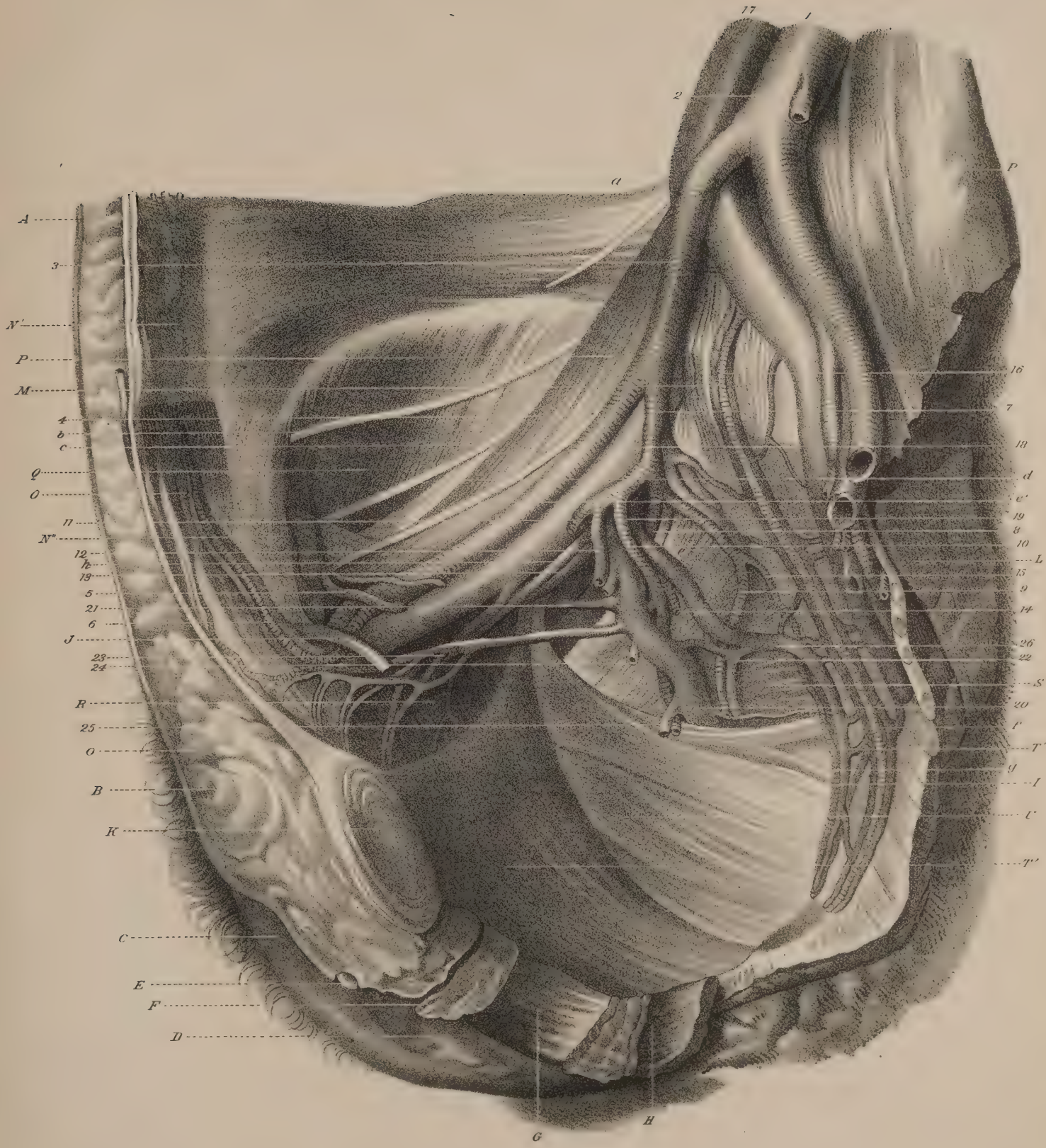

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PLATE XVI.

THIS PLATE IS A VIEW FROM ABOVE OF THE PELVIS OF AN ADULT FEMALE WITH THE CONTAINED VISCERA COVERED BY PERITONEUM.

A, Body of the uterus.
B, Left ovary.
C, Right fallopian tube.
D, Round ligament of the right side.
E, Upper and posterior part of the bladder.
F, Rectum.
G, *G*, Posterior face of the anterior wall of the abdomen.
H, *H*, Section of mesocolon.
I, *I*, Section of peritoneum binding down the cœcum.
J, Iliacus internus muscle covered with the iliac fascia.

1, Aorta.
2, Vena-cava ascendens.
3, Inferior mesenteric artery.
4, Epigastric vessels under the peritoneum.
5, Spermatic arteries and veins seen through the peritoneum.
6, The right ureter under the peritoneum.

PLATE XVII.

FEMALE ORGANS OF GENERATION.

A, Mons veneris.
B, Labia majora.
C, Clitoris.
D, Prepuce.
E, Glans clitoris.
F, Labia minora.
G, Meatus urinarius.

H, Carunculæ myrtiformes.
I, Orifice of vagina.
J, Fourchette.
K, Fossa navicularis.
L, Posterior commissure.
M, Perineum.
N, Anus.

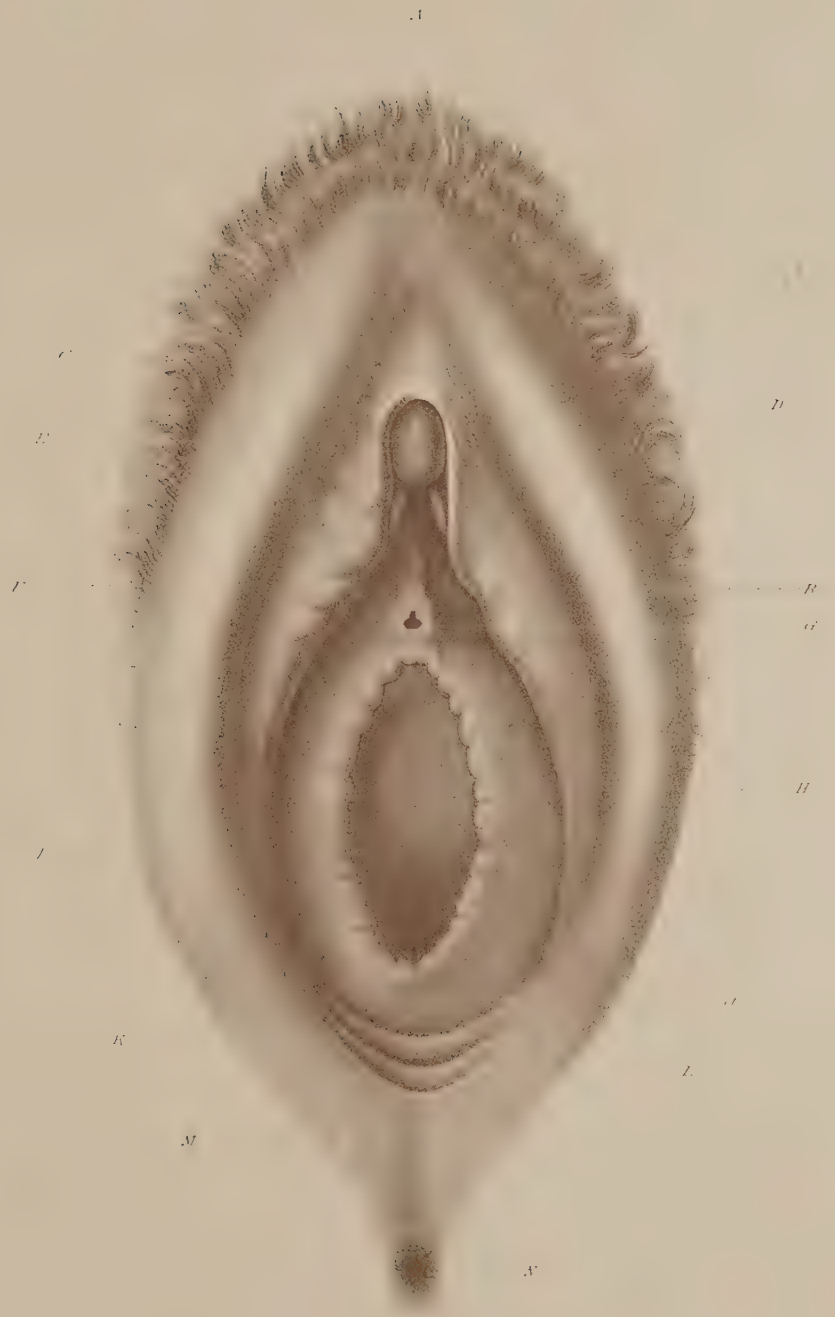
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PLATE XVIII.

VULVO-VAGINAL GLAND.

A, *A*, Section of the labia majora and of the nymphæ, showing the excretory duct and its orifice.
B, The gland.
C, Excretory duct.
C[1], Stylet engaged in the orifice of the excretory duct.
D, Its glandular extremity.
E, Its vulvar extremity and orifice.
F, Bulb of the vagina.
G, Ascending ramus of the ischium.

PLATE XIX.

SECTION OF AN ADULT FEMALE PELVIS, DIVIDED ANTERIORLY AT THE SYMPHYSIS PUBIS, AND POSTERIORLY AT THE LEFT SACRO-ILIAC ARTICULATION: THE BLADDER, VAGINA, AND UTERUS ARE DIVIDED AT THE MEDIAN LINE: THE RECTUM IS DIVIDED ONLY AT ITS INFERIOR PORTION.

A, Upper part of the right thigh.
B, The breech.
C, Anterior abdominal paries.
D, Left sacro-iliac symphysis.
E, Projection of the point of the coccyx through the posterior paries of the rectum.
F, Articular surface of the symphysis pubis.
G, Promontory of the sacrum.
H, Psoas muscle.
I, Pyriformis muscle.
J, Levator ani muscle.
J^{1}, Superior perineal aponeurosis.
K, Glutæus muscle.
L, Aorta.
M, Vena-cava ascendens.
N, Labium pudendi.
O, Labium internum.
Q, Canal of the urethra, opened laterally.
R, Spongy portion of the vagina.
S, Rectum, opened laterally.
T, Right lateral half of the uterus.
U, Origin of the fallopian tube.
V, Round ligament.
X, Ovarian vessels under the peritoneum.
Y, Anterior cul-de-sac of the peritoneum, between the bladder and the uterus.
Z, Posterior cul-de-sac of the peritoneum, between the vagina and rectum.

a, Left half of the bladder.
c, Rectum, opened laterally.
d, Anus.
e, *e*, *e*, *e*, Section of the peritoneum.

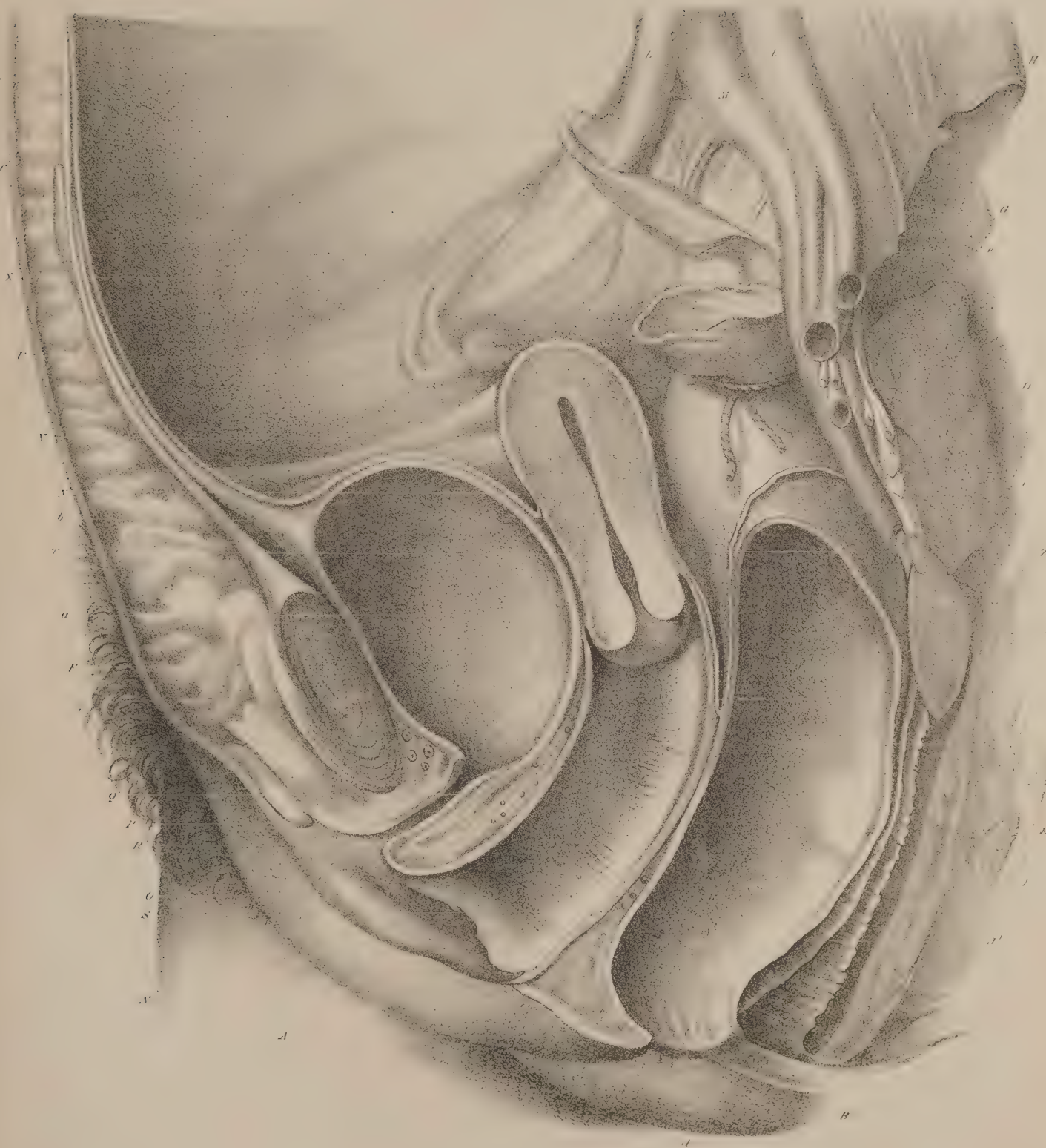


PLATE XX.

GENITAL ORGANS OF AN ADULT WOMAN, PRESENTING DIFFERENT SECTIONS, EXHIBITING THE EXTERNAL AND INTERNAL ARRANGEMENT.

Fig. 1, Representing the vagina, uterus, and its appendages in a normal condition.
a, Labia pudendi.
b, Nymphæ.
c, Entrance of the vulva.
d, Posterior median raphe of the vagina; transverse folds of this canal.
e, *e*, Section of the vagina throughout its whole extent on the anterior median raphe.
f, Anterior surface of the body of the uterus.
g, Vaginal orifice of the neck of the uterus.
i, Ovarian ligaments.
j, Fallopian tubes.
h, Ovarium.
k, Fimbriated extremity of the right side, displayed.
k[1], Fimbriated extremity of the left side, embracing the ovarium of that side.
l, Round ligaments.
m, *m*, Anterior lamina of the broad ligament.
n, *n*, Posterior lamina of the same ligament.

Fig. 2, Representing the posterior half of the uterus.
a, Cavity of the body of the uterus.
b, Cavity of the neck of the uterus.
d, Portion of the vagina.
c, *c*, Uterine orifices of the fallopian tubes.

Fig. 3, Antero-posterior section of the uterus on the median line.
a, Anterior lip of the os uteri.
b, Posterior lip of the os uteri.
c, Vagina.

Fig. 4, Representing a perpendicular section of the ovarium.
a, Ovarium.
b, Fibrous septum dividing the substance of the organ into cells.
c, Graafian vesicles.
d, General fibrous envelope giving origin to the internal septa.
e, Ligament of the ovarium.
f, Posterior surface of the uterus.
h, Round ligament divided near its origin.
g, Fallopian tube divided near its origin.

Fig. 5, Representing the cavity of the left fallopian tube opened throughout its whole extent.
a, Canal of the tube before its external enlargement.
b, Widened portion formed by the tube and fimbriated extremity.
c, Uterine portion of the same canal, greatly contracted.
d, Posterior left half of the uterus.
e, Ovarium.
f, Round ligament,
g, Origin of the broad ligament.

PLATE XXI.

UTERUS OF A WOMAN WHO DIED TWO DAYS AFTER DELIVERY, INTENDED TO EXHIBIT THE FIBRES AND VESSELS ON THE EXTERNAL SURFACE OF THIS ORGAN.

Fig. 1, On this Plate is seen the anterior surface of the uterus. It is impossible to indicate a constant direction for the fibres of the superficial plane alone, as it is not uniform in all cases. We shall point out those fasciculi which present some degree of regularity.

A, Round ligament.
B, Fallopian tube.
C, Circular fibre of the neck intersecting with the oblique fibres.
D, Fasciculus arising from the fundus uteri to assist in the formation of the round ligament.
E, Middle fasciculus performing the same office.
F, Inferior fasciculus ascending to be reflected over the posterior surface of the round ligament.
G, Portion of the peritoneum lining the fundus uteri, and which cannot be separated from it without laceration.

Fig. 2, Vessels of the uterus injected, seen on its anterior surface.
a, Trunk of the uterine artery.
a^{1}, a^{11}, Trunks of the uterine veins.
b, Ovarian artery.
c, Arterial and venous plexus distributed to the fallopian tubes.
d, Artery and veins following the course of the fallopian tubes.
e, Arterial and venous plexus distributed to the ovarium.
f, Artery and veins of the round ligament.
g, Free anastomosis between the veins of the two sides.
h, Other venous anastomoses.
k, Artery on the surface of the uterus.
l, Another artery.

Fig 1

Fig 2

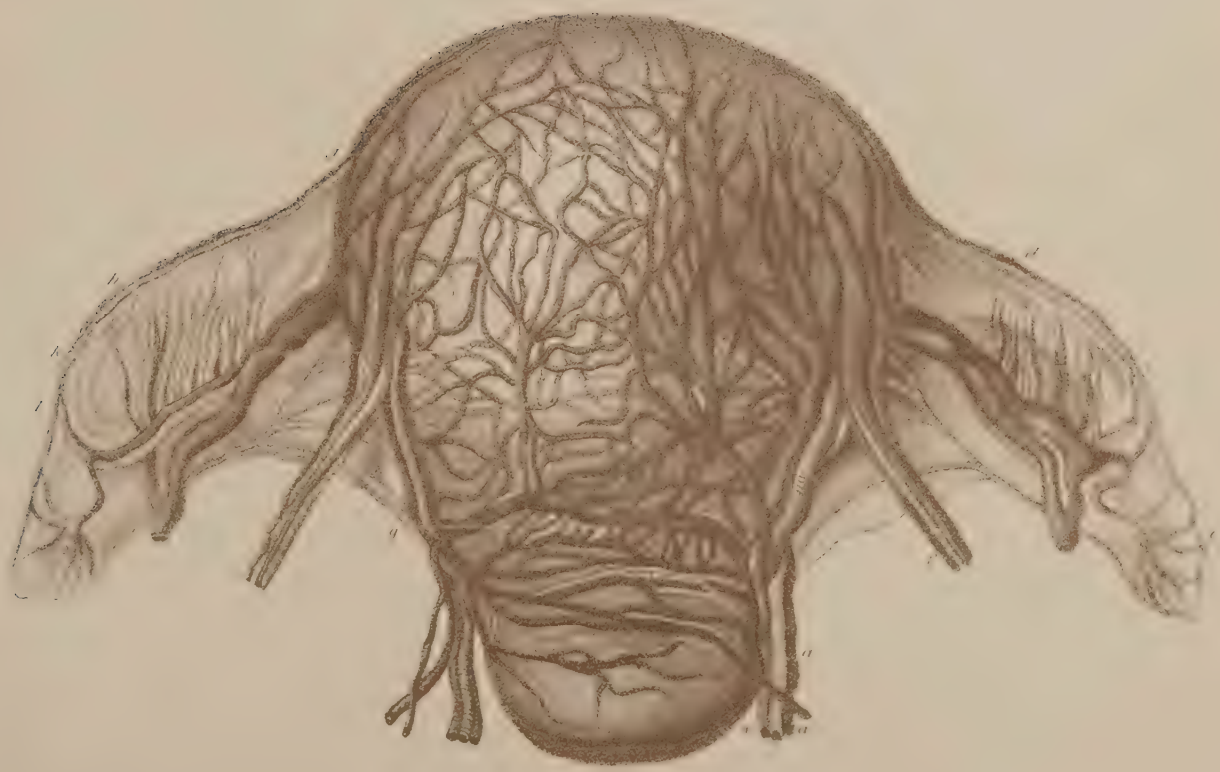


PLATE XXII.

UTERUS OF AN ADULT WOMAN WHO DIED FORTY-FOUR HOURS AFTER DELIVERY, INTENDED TO SHOW THE VASCULAR STRUCTURE AND THE PATULOUS ORIFICES OF THE VESSELS ON THE INTERNAL SURFACE OF THIS ORGAN.

Fig. 1, Represents a uterus opened by an incision anteriorly on the median line; the edges are widely separated, so that the whole of the internal surface is displayed. The injection has rendered very evident the orifices of the uterine sinuses which are scattered over the internal surface, with the exception of the neck.

Fig. 2, The same uterus seen on its internal surface and lateral portion. It has been endeavored to represent the direction of the fibres of the internal plane. This direction is evidently circular at the neck and around the internal orifice of the fallopian tube.

Fig 1

Fig 2

PLATE XXIV.

THIS PLATE REPRESENTS THE NERVES OF THE UTERUS AND OTHER PELVIC VISCERA OF A WOMAN WHO DIED FOUR DAYS AFTER DELIVERY.

A, Promontory of the sacrum.
B, Section of the horizontal ramus of the pubes outside of the symphysis.
C, Sacro-iliac symphysis.
D, The vagina.
E, The uterus.
F, The bladder.
G, The rectum.
I, Left ovarian artery.
J, Left ovarian vein.
H, Ovarium and fimbriated extremity of the tube.
K, Aorta, vena cava.

a, *a*, Right and left lumbar splanchnic nerves passing inside and in front of the aorta.
b, Plexus resulting from the anastomosis of the two preceding trunks.
c, Ovarian plexus arising from the usual plexus distributed to the ovarium and uterus, and establishing a direct relation between the latter and the loins. This nervous communication explains most satisfactorily the pains in the loins observed in some cases of parturition.
d, Communicating branch of the lumbar and sacral ganglia.
e, *e*, *e*, Sacral ganglia.
f, *f*, *f*, Origins of the sciatic nerve.
g, Fourth sacral branch giving off anastomotic branches to the hypogastric plexus and pelvic viscera.
i, Vesico-uterine branch arising from the sacral plexus.
j, Vesico-vaginal branch arising from the sacral plexus.
h, Another branch having the same origin as the preceding, and distributed to the bladder, vagina, and uterus.
k, Vaginal branch.
l, Anastomoses of the sacral branches with the hypogastric plexus.
m, Plexiform trunk of the great sympathetic which descends into the pelvis, and receives, in its passage, filaments sent to it by the sacral ganglia to form the hypogastric plexus, of which the ramifications are seen, are the sides of the uterus, vagina, and rectum.
n, Hypogastric plexus.
o, Ascending uterine nerves, furnished by the hypogastric plexus.

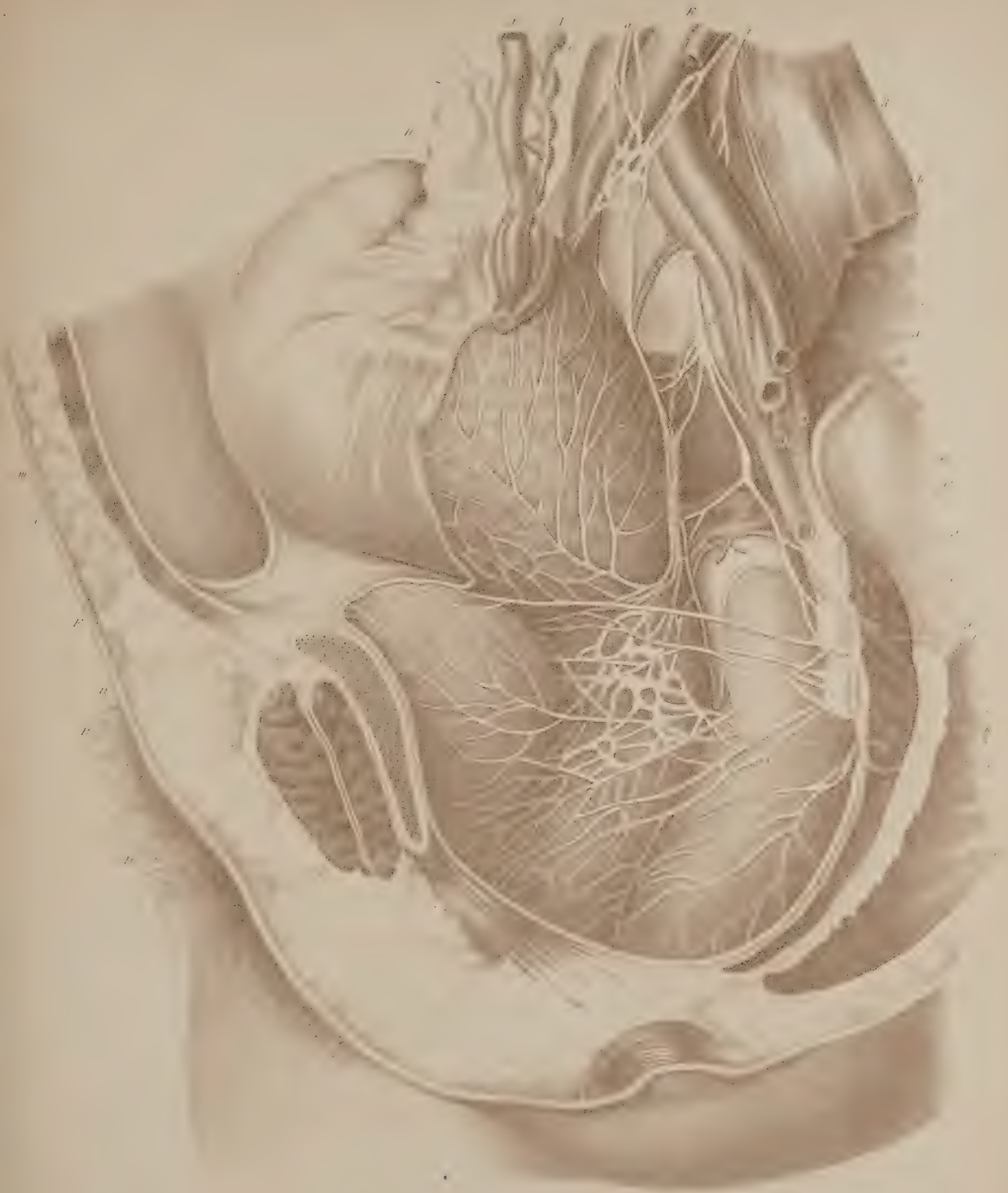


PLATE XXV.

THIS PLATE REPRESENTS:—1. AN OVUM MUCH MORE COMPLETE THAN THAT FIGURED IN PLATE XXVII. 2. A FŒTUS OF ABOUT THREE MONTHS, WITH ITS APPENDAGES.

The woman from whom the fœtus, represented in the first ten figures, was obtained, menstruated on the 17th of March, 1838. The catamenia continued until the 24th. She might have conceived from the 27th to the 28th of March. On the 27th of April, 1838, she was greatly fatigued by a long walk. On the 30th of April she was again fatigued: on the 1st of May a slight bloody discharge took place from the vulva, which, notwithstanding absolute rest, was followed, on the 4th of May, by the expulsion of the ovum.

Fig. 1, Ovum of the natural size, represented as it was expelled.

Fig. 2, The same ovum, in which the external membrane of the ovum, divided by a longitudinal section, exhibits the villosities of the charion.

Fig. 3, The same ovum, separated from the external membrane.

a, External membrane of the ovum, extended.

b, Ovum, separated from the external membrane by a sort of enucleation, and seen on the external surface of the chorion, and covered with villosities.

Fig. 4, Villosities of the chorion, seen through a microscope, and presenting a hydatiform aspect.

Fig. 5, The same ovum, opened by a section made on the edge of the placenta. The contained fluid has escaped from the extended chorion. The embryo may be perceived enveloped by the amniotic sac, and at its middle, near the pelvic extremity, the umbilical vesicle appears under the form of a bubble. The sac, containing the embryo, as well as the umbilical vesicle, adheres to the chorion by filaments imperceptible to the naked eye, but yet sufficiently strong to require some effort for their separation.

a, External and villous surface of the chorion.

b, Internal and smooth surface of the chorion.

c, Amniotic sac, containing the embryo.

d, Umbilical vesicle.

e, Point of adhesion of the amniotic sac with the chorion, which exhibits the rudiments of the umbilical cord.

Fig. 6, Another view of the same ovum. The sac containing the embryo has been removed, and its adhesions with the chorion have been broken. The rudiments of the cord may be distinctly seen, uniting with the contracted portion of the umbilical vesicle, in order to penetrate into the amniotic sac, and into the embryo itself.

a, External and villous surface of the chorion.

b, Internal and smooth surface of the chorion, seen at the point over which the vessels of the umbilical cord ramify.

c, Amniotic sac, enclosing the embryo.

d, Umbilical vesicle.

e, Umbilical vessels.

f, Pelvic extremity of the embryo, of a triangular form.

Fig. 7, Microscopic view of the same ovum, enlarged to seven diameters.

b, Internal surface of a portion of the inverted chorion.

c, Amniotic sac, enclosing the embryo.

d, Umbilical vesicle.

e, Point of termination of the umbilical vessels and the umbilical vesicle.

f, Pelvic extremity of the embryo.

g, Cephalic extremity.

Fig. 8, Microscopic view of the same embryo, escaped from the amniotic sac, and lying on the left side.

b, Remains of the chorion.

c, Amniotic sac, which, after having been divided on the anterior surface of the embryo, has been brought on the dorsal surface.

d, Umbilical vesicle.

e, Point of termination of the umbilical vessels, umbilical vesicle, and amniotic sac.

f, Hook of the pelvic extremity, formed by the sacrum and coccyx.

g, Cephalic extremity of the embryo.

h, Visceral mass.

Fig. 9, Microscopic view of the same embryo, lying on its back.

a, Cephalic extremity.

b, Confused visceral mass, situated below the head, and which we suspect would form the thoracic viscera.

c, Another visceral mass.

d, *d*, Two distinct lateral appendages, adherent to the middle of the body of the embryo. These lateral appendages, the nature of which we cannot determine, and which we have never before so distinctly observed, might be the rudiments of the thoracic extremities. Removed, and examined by the microscope, they appeared to be formed of molecules, closely resembling globules of blood.

e, Coxal enlargements of the pelvic extremity.

Fig. 10, Microscopic view of the same embryo, lying on the right side. The transparency of the tissues shows the following objects:

a, Transverse striæ, indicating the rudiments of the vertebræ.

b, Aorta, filled with blood.

c, Another large vessel, which we take to be the vena cava ascendens, or the vena portæ. In the pelvic portion, this vessel is parallel to the aorta, soon separates from it, and appears to be lost in the liver or with the umbilical vessels.

d, Rudiments of the umbilical cord.

e, Intestinal mass.

f, Visceral mass, formed apparently by the liver.

g, Another visceral mass, which we suppose was the heart and thoracic viscera.

Fig. 11, Fœtus, of about three months of the natural size.

A, Umbilical cord, along which the vessels are as yet parallel.

B, Fœtal surface of the placenta.

Fig 6
Fig 5
Fig 2
Fig 1
Fig 3
Fig 4
A
B
Fig 7
Fig 8
Fig 9
Fig 10

PLATE XXVI.

THIS PLATE REPRESENTS A UTERUS WITH THE APPENDAGES OF THE FŒTUS WHICH ADHERE TO IT.

This anatomical specimen was obtained, in the Lying-in Hospital of Paris, from a woman who died of convulsions in the latter period of pregnancy. It was prepared by M. Blandin, Chief Prosector of the Parisian Medical Faculty, and carefully examined in the presence of several physicians and pupils. A red injection was thrown into the arteries, and a blue one into the veins of the mother. The injecting matter having reached the placenta, but not the vessels of the umbilical cord, the latter were filled directly: the vein with a white, and the arteries with a yellow substance.

The placenta, partly separated at one of its edges, and inverted on itself, exhibits the numerous utero-placental vessels.

A, *A*, Section of the parietes of the body of the uterus.

A^1 A^1, Section of the parietes of the neck of the uterus.

B, Surface of the uterus corresponding to the portion of separated placenta.

C, Uterine surface of the placenta separated and inverted.

D, Umbilical cord.

E, Knot in the umbilical cord.

F, *F*, Chorion still increased by the caduca reflexa.

G, Section of the amnion or the fœtal surface of the placenta.

H, Portion of the uterine caduca isolated and inverted.

H^1, Uterine caduca adhering to the uterus.

H^2, Very long and apparent vessels developed in the caduca uterina. By means of slight pressure, we were able to cause the blood contained in these vessels to circulate, and, by opening them, to perceive their internal cavity.

I, *I*, Species of coronary sinus filled with the blue injection which had been thrown into the mother's veins. This sinus existed regularly only for about one-third of the circumference of the placenta. The injection not having penetrated further, we have inferred the *unknown from the known*, and represented it uniformly over the whole surface of the placenta. We should, however, state that this probable supposition is not strictly proven.

I^1, I^1, A portion of the same sinus opened.

I^2, I^2, Corresponding part of the same sinus, seen from the edge of the placenta.

J, *J*, Another sinus anastomosing with the coronary sinus, after a passage of more than an inch under the caduca, and in the substance of the parietes of the uterus.

K, *K*, *K*, *K*, Utero-placental arteries distended by the injection thrown into the arteries of the mother: they are remarkable for their size, number and tortuous disposition. Leaving the uterus, after having ramified over the internal surface of this viscus for about an inch between the uterus and placenta, they are directed toward the uterine surface of the latter, penetrate for a line or two in the thickness of its lobes, and suddenly terminate without sensibly diminishing in size or being further subdivided.

L, *L*, Venous sinus, situated behind the placenta, passing for several lines between the uterus and placenta, and having no other parietes than that furnished by the temporary tissue between these two organs.

L^1,L^1, Prolongations of the preceding sinuses toward the internal surface of the placenta, completing the parietes of these singular venous vessels.

PLATE XXVII.

SKELETON OF A FŒTUS AT TERM: THE HEAD FIGURED IN VARIOUS POSITIONS, SO AS TO EXHIBIT THE FONTANELLES SUTURES AND REGIONS OF THE CEPHALIC EXTREMITY OF THE FŒTUS.

Fig. 1, Skeleton of a fœtus at term.
1, Anterior fontanelle.
2, Frontal protuberances.
3, Parietal.
4, Great wing of the sphenoid.
5, Cavities of the orbits.
6, Bones of the nose.
7, Septum narium.
8, Malar bone.
9, Superior maxillary bone.
10, Inferior maxillary bone.
11, Cervical vertebræ.
12, Twelfth dorsal vertebræ.
From 12 to 13, the five lumbar vertebræ.
14, Sacral vertebræ.
15, Coccyx.
16, Various points of ossification of the sternum.
17, Cartilaginous portion of the sternum.
18, Cartilages of the true or sternal ribs.
18^1, Cartilages of the false or asternal ribs.
From 19 to 20, The seven sternal ribs.
From 20 to 21, The five asternal ribs.
21, Last false or floating rib.
22, Clavicles.
22^1, Sub-scapular surface of the shoulder-blade.
23, Scapulo-humeral articulation.
24, Osseous state of the shaft of the humerus.
25, Humero-cubital articulation.
26, Osseous state of the radius.
27, Osseous state of the ulna, the extremities being cartilaginous.
28, Double row of the carpal bones, in the cartilaginous state.
29, 30, Metacarpal bones.
31, 32, First phalanges.
33, 34, Second phalanges.
35, 35^1, Third phalanges.
36, Iliac bones.
37, Pubes, in the cartilaginous state.
38, Ilio-femoral articulation.
39, Shaft of the os femoris, terminated by its cartilaginous epiphyses.
40, Femoro-tibial articulation.
41, Body of the tibia, the extremities being cartilaginous.
42, Fibula, extremities cartilaginous.
43, Tarsal bones, still cartilaginous.
44, 45, Middle portion of the five metatarsal bones, in the osseous state.
46, 47, Bodies of the first phalanges, in the osseous state.
48, 49, Bodies of the second phalanges.
50, 50^1, Third phalanges.

Fig. 2, Lateral view of a fœtal head at term, stripped of its soft parts.
1, Left half of the frontal bone.
2, Left parietal.
3, Left half of the occipital bone.
4, Left temporal.
5, Great wing of the sphenoid.
6, Ossa nasi.
7, Left malar bone.
8, Superior maxillary bone.
9, Inferior maxillary bone.
10, Meatus auditorius externus.
11, Left lateral and anterior fontanelle.
12, Left lateral and posterior fontanelle.
13, Left parietal protuberance.

a, *b*, Occipito-mental diameter, five inches.
c, *d*, Occipito-frontal diameter, four inches three lines.
E, *F*, Cervico-bregmatic diameter, three inches six lines.
G, *H*, Vertical diameter, three inches four lines.
I, *J*, Fronto-mental diameter, three inches six lines.

Fig. 3, Posterior region of the same head.
1, 1, The two parietal bones.
2, 2, Posterior part of the temporal bones.
3, Condyles of the occiput.
4, Inferior maxillary bone.
5, Foramen magnum occipitis.
6, 6, Parietal protuberances.
7, 7, Posterior lateral fontanelles.
8, Lambdoidal suture.

A, *B*, Bi-parietal diameter, three inches four lines.

Fig. 4, Vertical view of the same head.
1, 1, Double portion of the frontal bone.
2, 2, Parietal bones.
3, Superior angle of the occipital bone.
4, Anterior fontanelle.
5, 5, Sagittal suture.
6, Posterior fontanelle.

A, *B*, Bi-parietal diameter.

Fig. 5, View of the base of the same cranium.
1, Frontal bone.
2, 2, Parietal bones.
3, Occipital.
4, Sphenoidal bone.
5, Malar bone.
6, Inferior maxillary bone.
7, Foramen magnum occipitis.
8, 8, Meatus auditorii externi.
9, 9, Posterior and inferior lateral fontanelles.

Fig 1

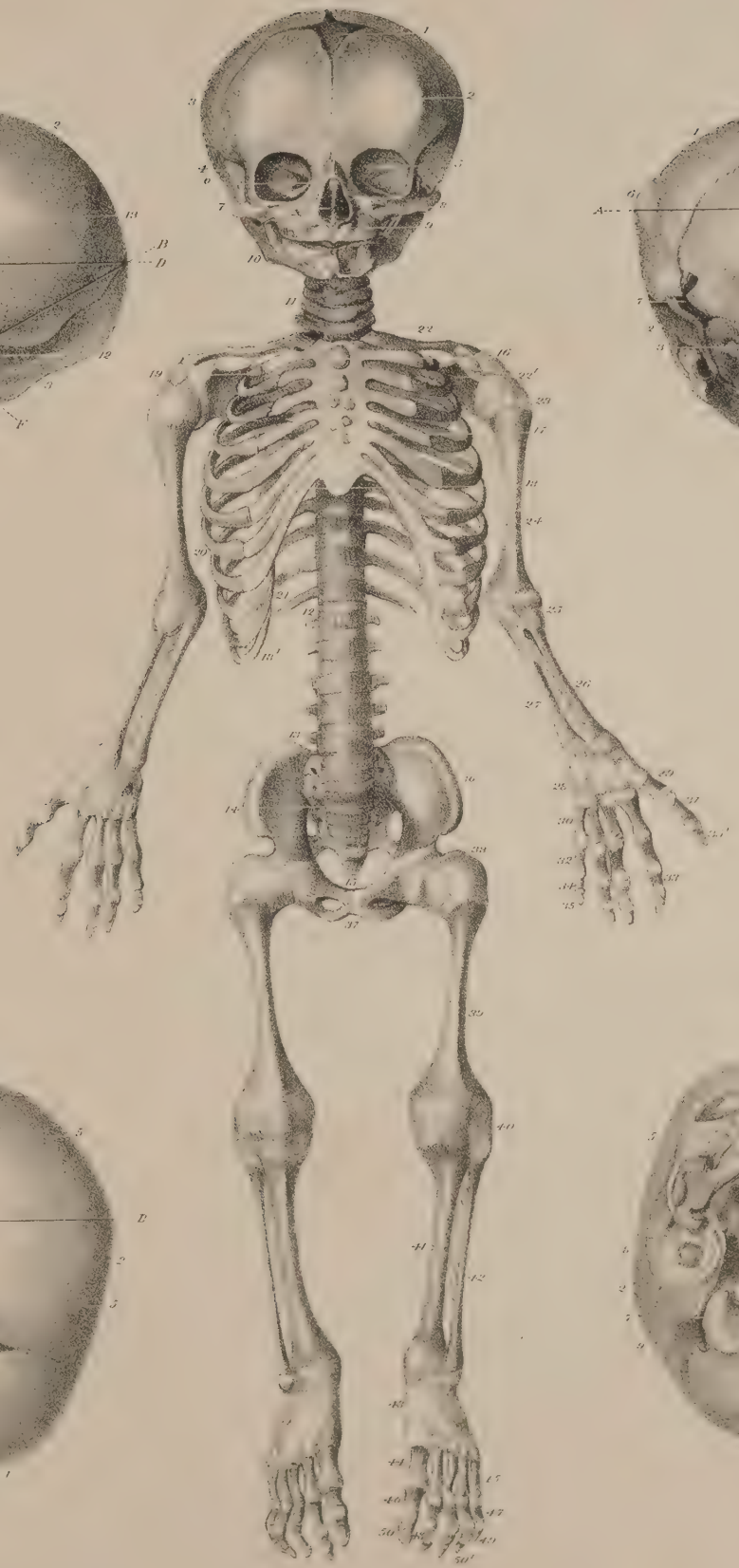


Fig 2.

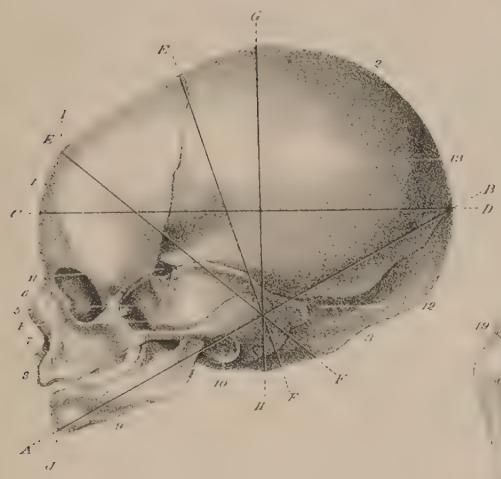


Fig 3

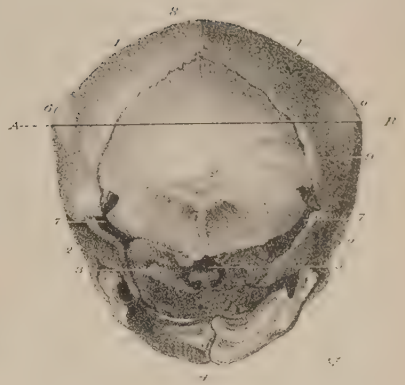


Fig 4

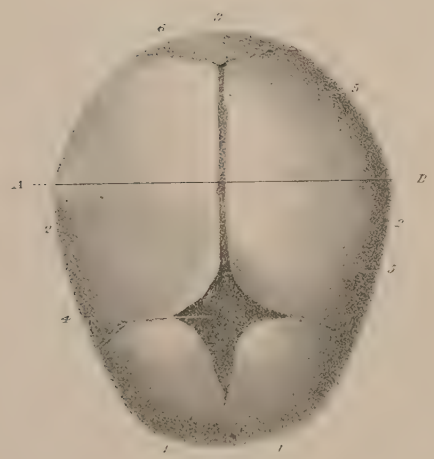


Fig 5

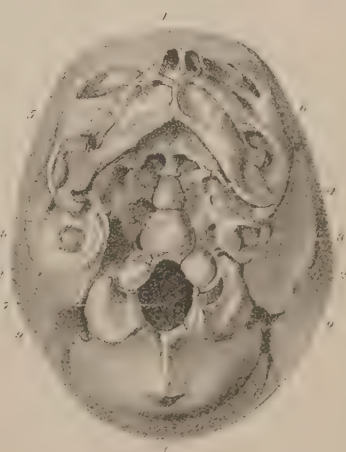


PLATE XXVIII.

FŒTAL CIRCULATION.

Fig. 1. Distribution of the sanguineous vascular system in the thoracic and abdominal viscera, with the exception of the thymus gland and alimentary canal, which have been removed. (Half size.)

A, Anterior surface of the heart.
B, Left lung.
C, Thyroid body.
D, Inferior surface of the liver, elevated and turned outward.
E, The gall-bladder.
F, The spleen.
G, *G*, The kidneys.
H, The rectum.
I, The uterus.
K, The bladder.
L, The diaphragm.
M, The ureter.

1, Origin of the aorta.
2, Pulmonary artery.
3, Vena cava descendens.
4, Arteria innominata.
5, Left subclavian vein.
6, Right primitive carotid artery.
7, Left internal jugular vein.
8, Abdominal aorta.
9, Opening of the vena cava descendens into the right auricle of the heart.
10, Vena cava ascendens, nears its bifurcation into primitive iliac.
11, Cœliac axis.
12, Umbilical cord.
13, Ovarian artery and vein.
14, Right primitive iliac artery.
15, Left primitive iliac vein.
16, The umbilical arteries, separated by the urachus.
17, Mesenteric veins.
17^1, Splenic vein forming, with the preceding, the trunk of the vena portæ.
18, Renal artery and veins.
19, Umbilical vein.
20, Ductus venosus.

Fig. 2, Origin of the vessels at the base of the heart· ductus arteriosus. (Natural size.)

A, Right ventricle of the heart.
A^1, Left ventricle of the heart.
B, Right auricle.
C, Left auricle.
D, Aorta.
E, Pulmonary artery.
F, Ductus arteriosus.
G, Left pulmonary artery.
H, Vena cava descendens.
I, Arteria innominata.
K, Right primitive carotid artery.
L, Right subclavian artery.
M, Left primitive carotid artery.
O, Left subclavian artery.
P, Termination of the arch of the aorta.
Q, *Q*, *Q*, *Q*, Lungs.

Fig. 3, Cavities of the right auricle and ventricle; foramen of Botal. (Natural size.)

A, Inter-auricular septum.
B, *B*, Section of the parietes of the right auricle.
C, Cavity of the right ventricle.
D, *D*, *D*, Section of the parietes of the right ventricle.
E, Inter-auricular communication, or foramen of Botal.
F, Vena cava ascendens.
G, Vena cava descendens.

Fig. 4, Inferior surface of the liver. (Natural size.)

A, *A*, *A*, *A*, Circumference of the liver.
B, Lobulus Spigelii.
C, Gall bladder.
D, Opening of the vena cava ascendens into the heart.
E, Hepatic veins at their opening into the vena cava.
F, Vena cava below the liver.
G, *G*, Branches which furnish the umbilical vein in the substance of the liver, previously to meeting with the vena portæ.
H, Trunk of the umbilical vein near the groove of the same name.
K, Trunk of the vena portæ.

Fig. 5, Lumbar and pelvic vessels; origin of the umbilical arteries.

A, Promontory of the sacrum.
B, *B*, Psoas muscles.
C, *C*, Section of the anterior paries of the abdomen.
D, Rectum.
E, Bladder.
F, Umbilicus.
G, Umbilical cord.
H, Aorta.
I, Vena cava ascendens.
K, Primitive iliac artery.
L, Left primitive iliac vein.
M, Internal iliac artery.
N, External iliac artery.
O, Umbilical arteries.
P, Umbilical vein.
Q, Urachus.

Fig. 1

Fig. 2

Fig. 3

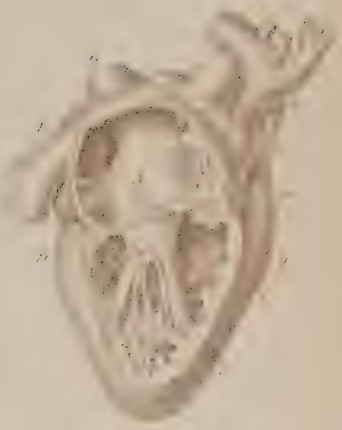


Fig. 4

Fig. 5

PLATE XXIX.

RELATIONS OF THE FŒTAL HEAD WITH THE SUPERIOR STRAIT IN TWO OF THE DIRECT POSITIONS.

Fig. 1, First direct position, or left occipito-iliac.

Fig. 2, Second direct position, or right occipito-iliac.

Fig. 1.

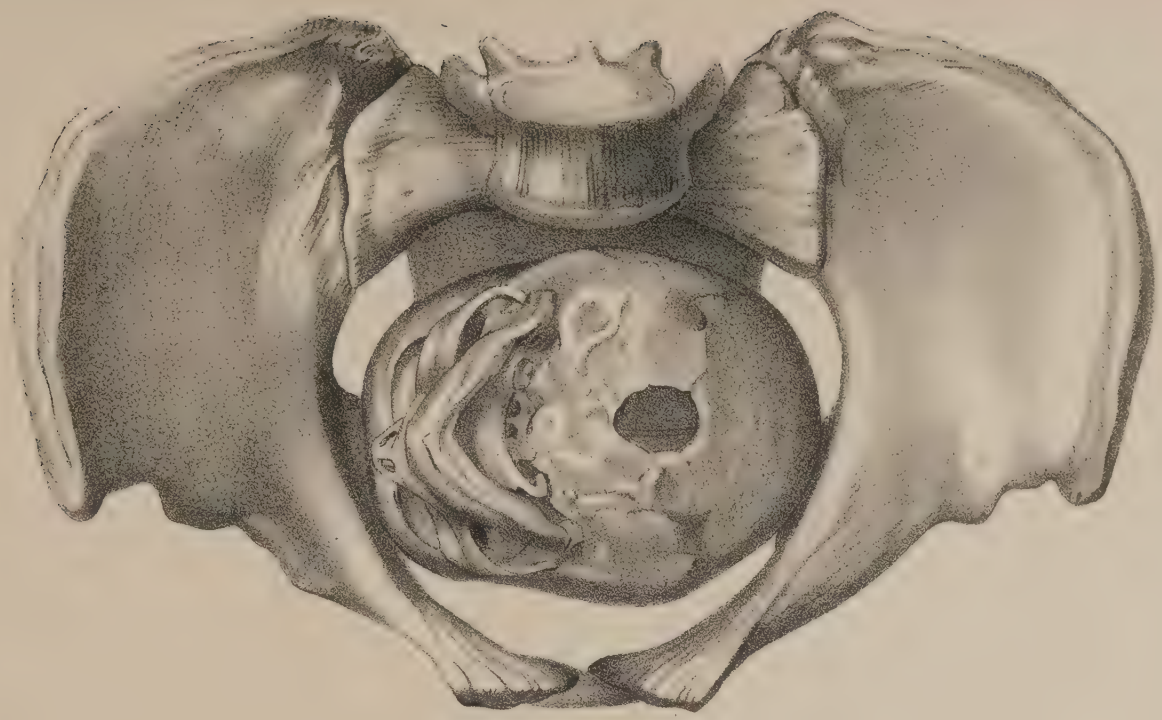


Fig. 2.

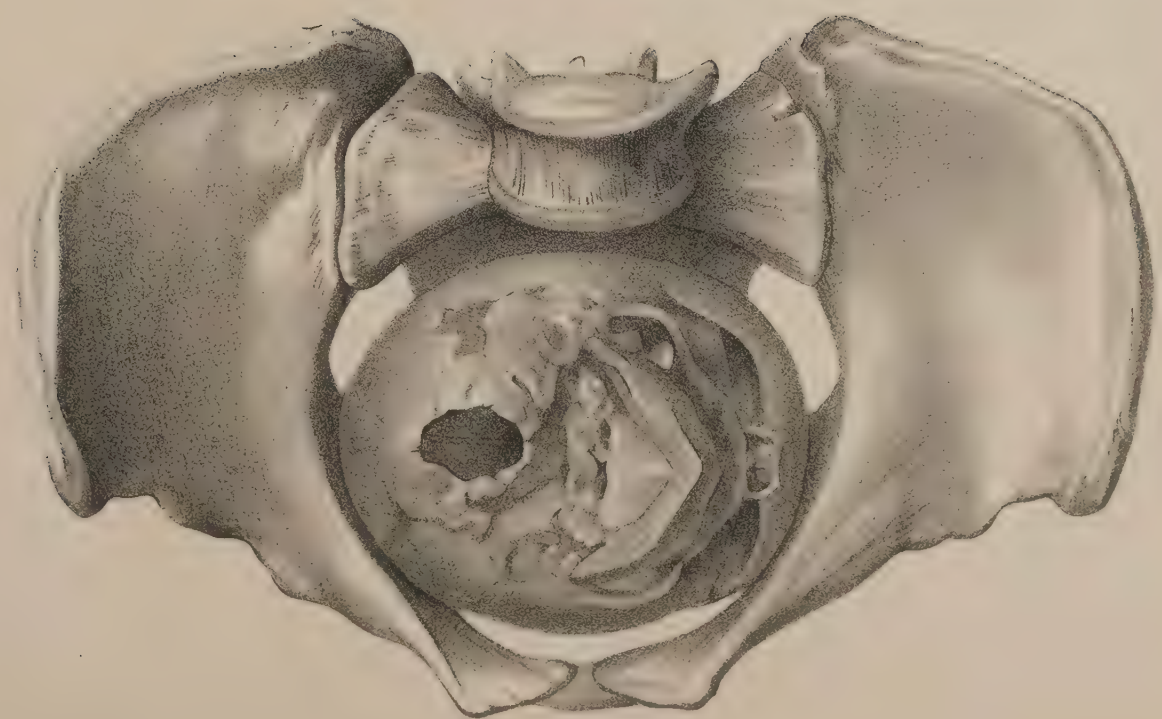


PLATE XXX.

RELATIONS OF THE FŒTAL HEAD WITH THE SUPERIOR STRAIT IN TWO OF THE DIRECT POSITIONS.

Fig. 1, Third direct position, or occipito-pubal.

Fig. 2, Fourth direct position, or occipito-sacral.

Fig 1

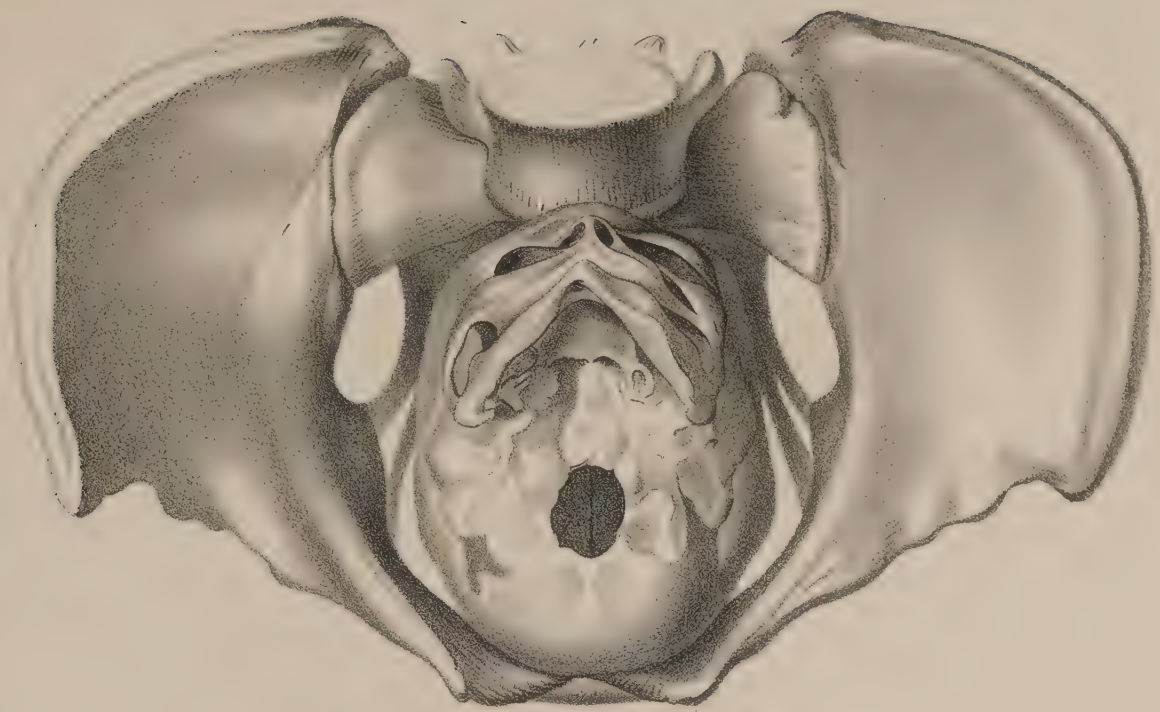


Fig 2

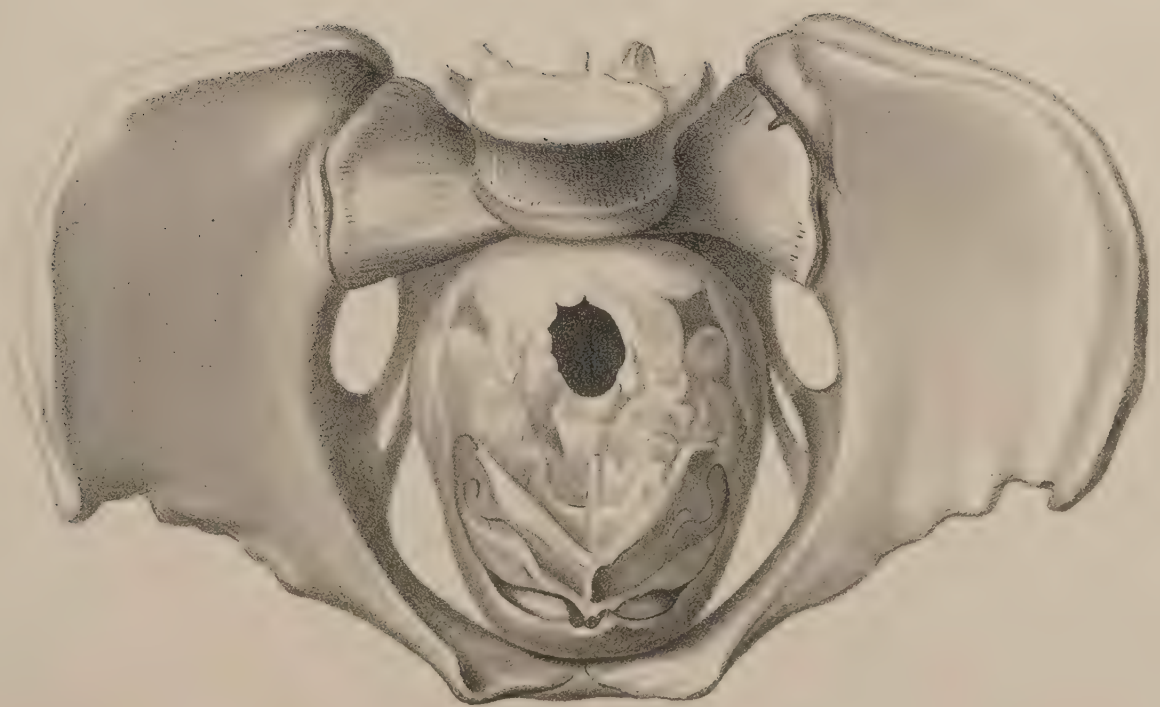


PLATE XXXI.

RELATIONS OF THE FŒTAL HEAD WITH THE SUPERIOR STRAIT IN TWO OF THE OBLIQUE POSITIONS.

Fig. 1, First oblique position, or left occipito-acetabular. | Fig. 2, Second oblique position, or right occipito-acetabular.

Fig. 1

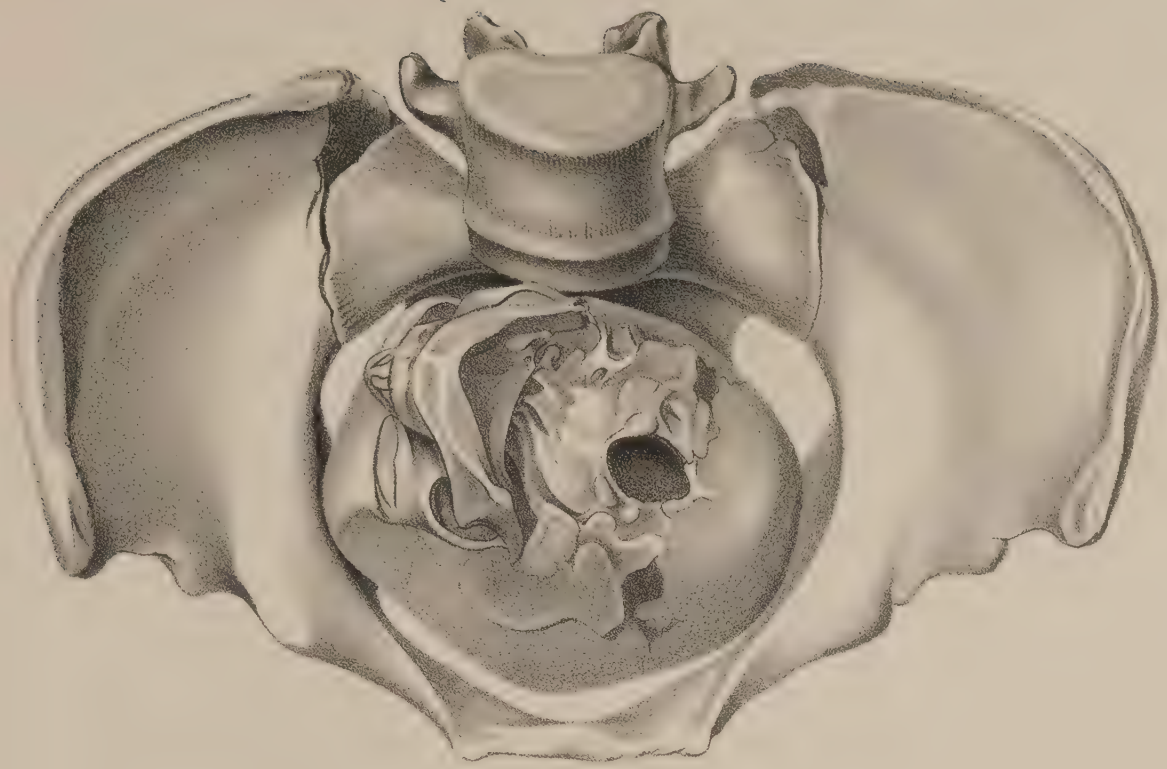


Fig. 2

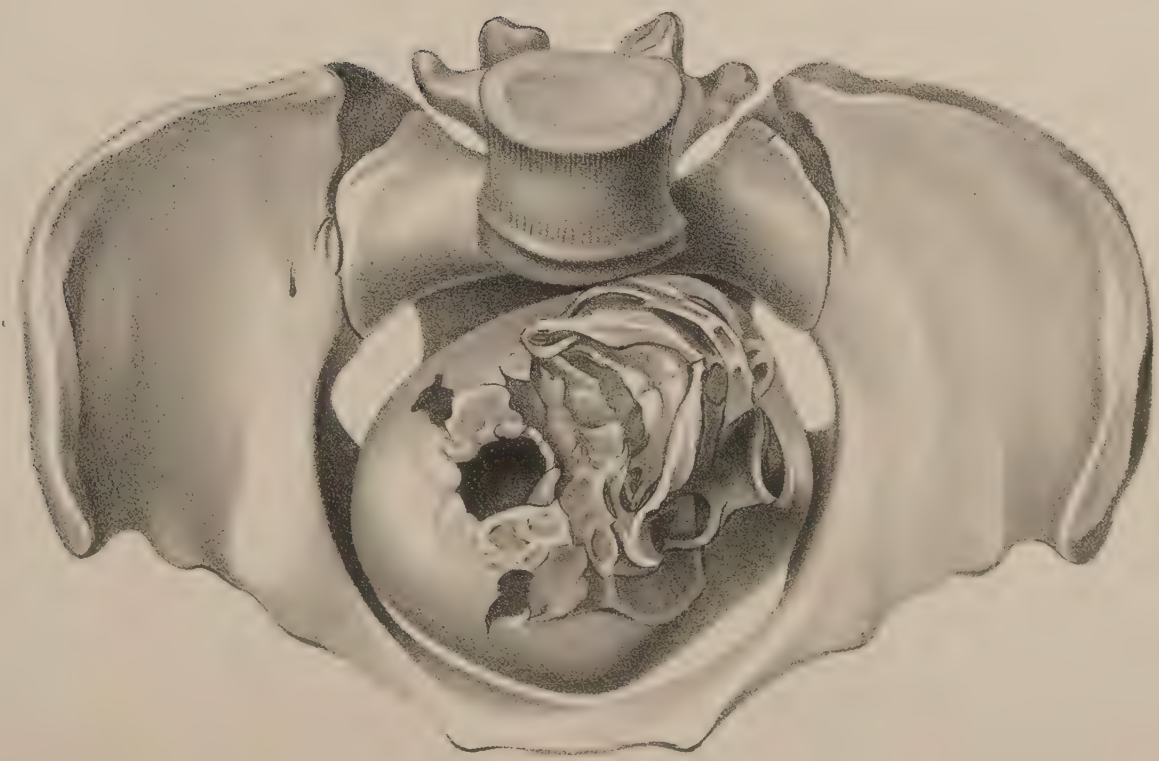


PLATE XXXII.

RELATIONS OF THE FŒTAL HEAD WITH THE SUPERIOR STRAIT IN TWO OF THE OBLIQUE POSITIONS.

Fig. 1, Third oblique position, or right occipito-posterior or left fronto-acetabular.

Fig. 2, Fourth oblique position, or left occipito-posterior or right fronto-acetabular.

Fig. 1.

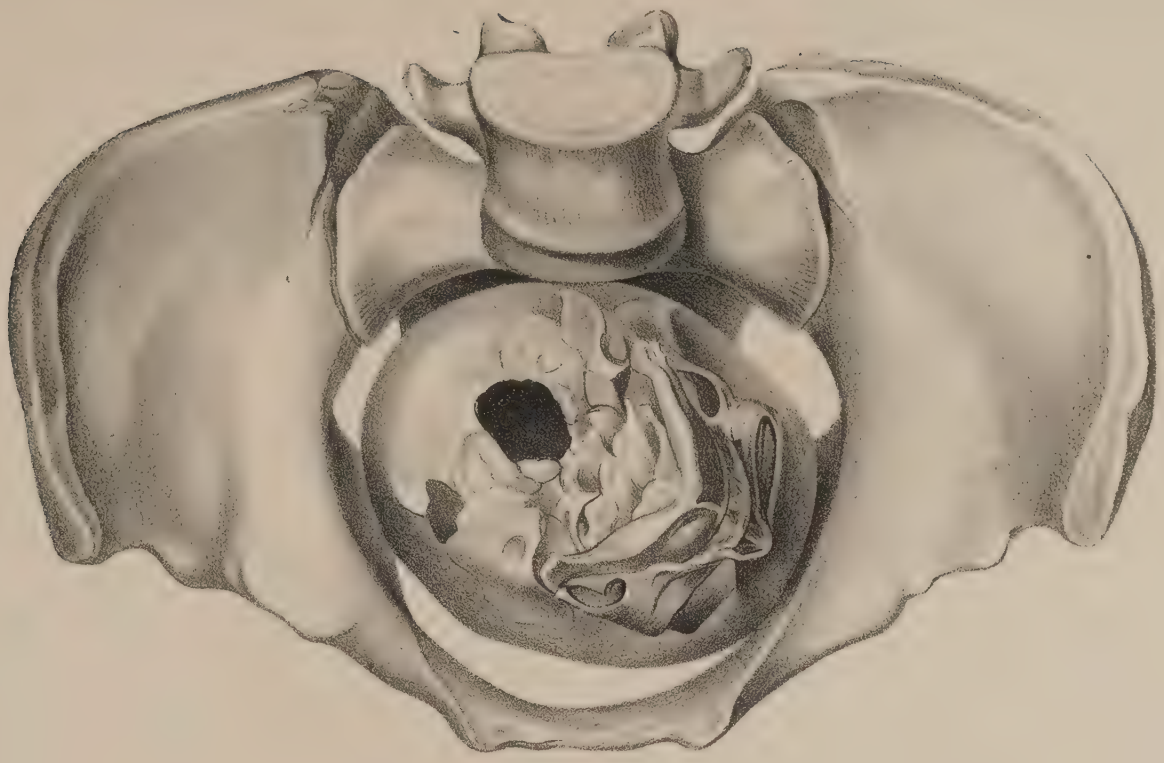


Fig 2.

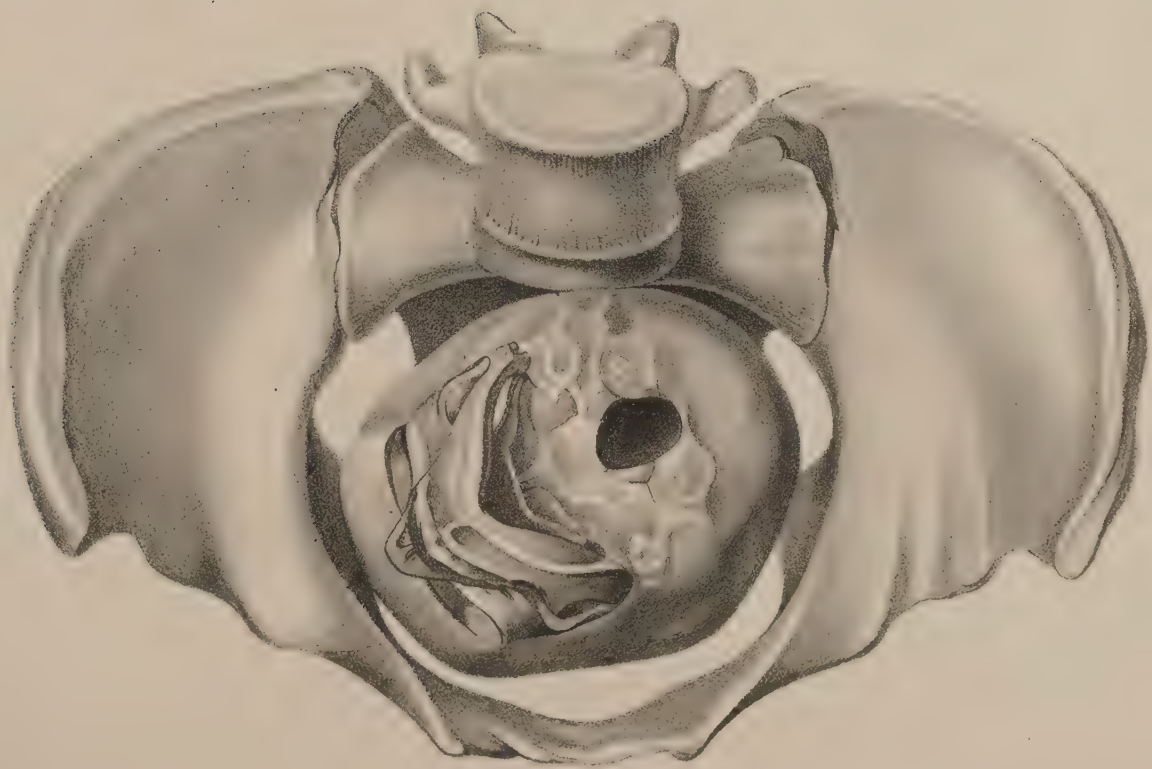


PLATE XXXIII.

THIS PLATE EXHIBITS THE FORM, SIZE, AND SITUATION OF THE UTERUS COMPLETELY DEVELOPED BY THE PRODUCT OF CONCEPTION, AND THE RELATIONS IT BEARS TO THE DIFFERENT ORGANS CONTAINED IN THE ABDOMINAL CAVITY.

1, 1, 1, 1, Parietes of the abdomen crucially divided and turned backward.
A, Inferior portion, or small extremity of the uterine globe engaging in the superior strait.
B, Round or supra-pubic ligament of the right side.
C, Superior portion, fundus, or large extremity of the uterus inclined to the right.
D, Expansion of the fibres of the round ligament of the right side.
E, Portion of the ascending colon.
F, Right angle of the transverse colon.
G, Transverse colon covered by the omentum majus.
H, *H*, Convolutions of the small intestine.
I, The stomach.
K, The liver.

PLATE XXXIV.

SAME GENERAL RELATIONS AS IN THE PRECEDING PLATE: THE ANTERIOR HALF OF THE UTERUS HAS BEEN REMOVED, IN ORDER TO DISPLAY ONE OF THE POSITIONS OF THE FŒTUS AT TERM; THE CEPHALIC EXTREMITY IS TURNED DOWNWARD; THE POSTERIOR PLANE OF THE FŒTUS IS DIRECTED TO THE LEFT AND BACKWARD. (FOURTH OBLIQUE POSITION, OR RIGHT FRONTO-ACETABULAR.)

A, Liver.
B, Stomach.
C, *C*, Convolutions of the small intestine.
D, Ascending colon.
E, Transverse colon: the omentum majus has been removed in order to expose the intestine.
F, Omentum majus.
H, *H*, Section of the parietes of the uterus.
I, Round ligament of the right side.
J, Umbilical cord.
K, Portion of the placenta adhering to the fundus of the uterus.

PLATE XXXV.

SUCCESSIVE STAGES OF THE FIRST POSITION.

PLATE XXXVI.

FRONTO-ANTERIOR TERMINATION OF THE THIRD POSITION.

PLATE XXXVII.

AFTER-BIRTH BY THE CORD.

PLATE XXXVIII.

AFTER-BIRTH BY EXPULSION.

PLATE XXXIX.

BIRTH OF THE HEAD, THE OCCIPUT LYING ANTERIORLY.

The support of the perineum by the hand of the obstetrician.

PLATE XL.

EXTRACTION OF AN ADHERENT PLACENTA.

PLATE XLI.

REMOVAL OF THE PLACENTA. TWISTING THE MEMBRANES INTO A CORD SO THAT NO PORTION MAY REMAIN BEHIND IN THE UTERINE CAVITY.

PLATE XLII.

REMOVAL OF THE PLACENTA WITH THE PLACENTAL FORCEPS.

PLATE XLIII.

MECHANISM OF NATURAL LABOR, IN THE FIRST OBLIQUE POSITION OF THE VERTEX. (LEFT OCCIPITO-ACETABULAR.)

Termination of the first period. The fœtus has undergone a motion of flexion; it has decended to the bottom of the pelvic excavation, preserving the general relations it had on entering the superior strait.

A, Symphysis pubis.
B, Bladder.
C, Anal aperture.
D, Promontory of the sacrum.

B
A
D
C

PLATE XLIV.

MECHANISM OF A NATURAL LABOR IN THE FIRST OBLIQUE POSITION OF THE VERTEX. (LEFT OCCIPITO-ACETABULAR.)

Second period. The head of the fœtus has abandoned the diagonal position; it has executed a motion of rotation from left to right; the occiput is brought behind and beneath the symphysis pubis; the forehead and face have departed from the right sacro-iliac symphysis, and are lodged in the cavity of the sacrum. The general relations of the head are changed; the bi-parietal diameter is parallel to the bis-iliac diameter of the excavation. The occipito-mental diameter is nearly in the direction of the axis of the inferior strait. The relative position of the body of the fœtus has not changed; it is the same as in the preceding Plate, thus indicating that the motion of rotation of the head has been effected by the simple torsion of the neck.

PLATE XLV

MECHANISM OF NATURAL LABOR, IN THE FIRST OBLIQUE POSITION OF THE VERTEX. (LEFT OCCIPITO-ACETABULAR.)

Third period. The head of the fœtus performs a motion of extension, during which the occiput glides beneath and in front of the symphysis pubis, whilst the forehead and face traverse the inclined plane presented by the curvatures of the sacrum, coccyx, and perineum. The shoulders of the fœtus engage in the direction of the oblique diameter of the superior strait, which has given passage to the bi-parietal diameter of the head.

PLATE XLVI

MECHANISM OF NATURAL LABOR, IN THE FIRST OBLIQUE POSITION OF THE VERTEX. (LEFT OCCIPITO-ACETABULAR.)

Fourth period. The head of the fœtus, having escaped through the inferior strait and vulva, being no longer retained, has just performed a motion of restitution, which brings it into a position analogous to that which it had before entering the superior strait. The occiput is directed toward the left groin of the mother, whilst the forehead and face look toward the internal and posterior part of the mother's right thigh. The shoulders of the fœtus, plunged in the pelvic excavation, have performed a motion of rotation which has placed the right shoulder behind the symphysis pubis, and the left shoulder in the cavity of the sacrum.

PLATE XLVII.

MECHANISM OF NATURAL LABOR, IN THE FOURTH DIRECT POSITION OF THE VERTEX, (OCCIPITO-SACRAL,) AND IN THE THIRD AND FOURTH OBLIQUE POSITIONS, WHERE THE OCCIPUT COULD NOT BE BROUGHT BEHIND THE SYMPHYSIS PUBIS.

Second period. The head of the fœtus has descended into the pelvic excavation. The occiput occupies the cavity of the sacrum. The forehead, placed behind the symphysis pubis, has begun to ascend during the motion of forced flexion performed by the head, in order to escape from the inferior strait and vulva.

PLATE XLVIII.

MECHANISM OF NATURAL LABOR, IN THE FOURTH DIRECT POSITION OF THE VERTEX, (OCCIPITO-SACRAL,) AND IN THE THIRD AND FOURTH OBLIQUE POSITIONS, WHERE THE OCCIPUT COULD NOT BE BROUGHT BEHIND THE SYMPHYSIS PUBIS.

Third period. The head of the fœtus, having overcome the resistance presented by the perineum and vulva, has commenced a motion of extension. The perineum is placed behind the occiput; the forehead passes beneath the symphysis pubis, and appears at the anterior commissure of the vulva, where it will be soon followed by the nose, mouth and chin, which will disengage in front, in proportion to the direction backward, of the occiput rolling against the anterior edge of the perineum.

PLATE XLIX.

MECHANISM OF NATURAL LABOR, IN THE SECOND POSITION OF THE FACE. (LEFT MENTO-ILIAC.)

First period. The fronto-mental diameter of the face of the fœtus is parallel to the bis-iliac of the superior strait. The chin corresponds to the left ilium, whilst the vertex is directed toward the right ilium. The face begins to engage in the pelvic excavation, and will preserve the same position until it has completely descended.

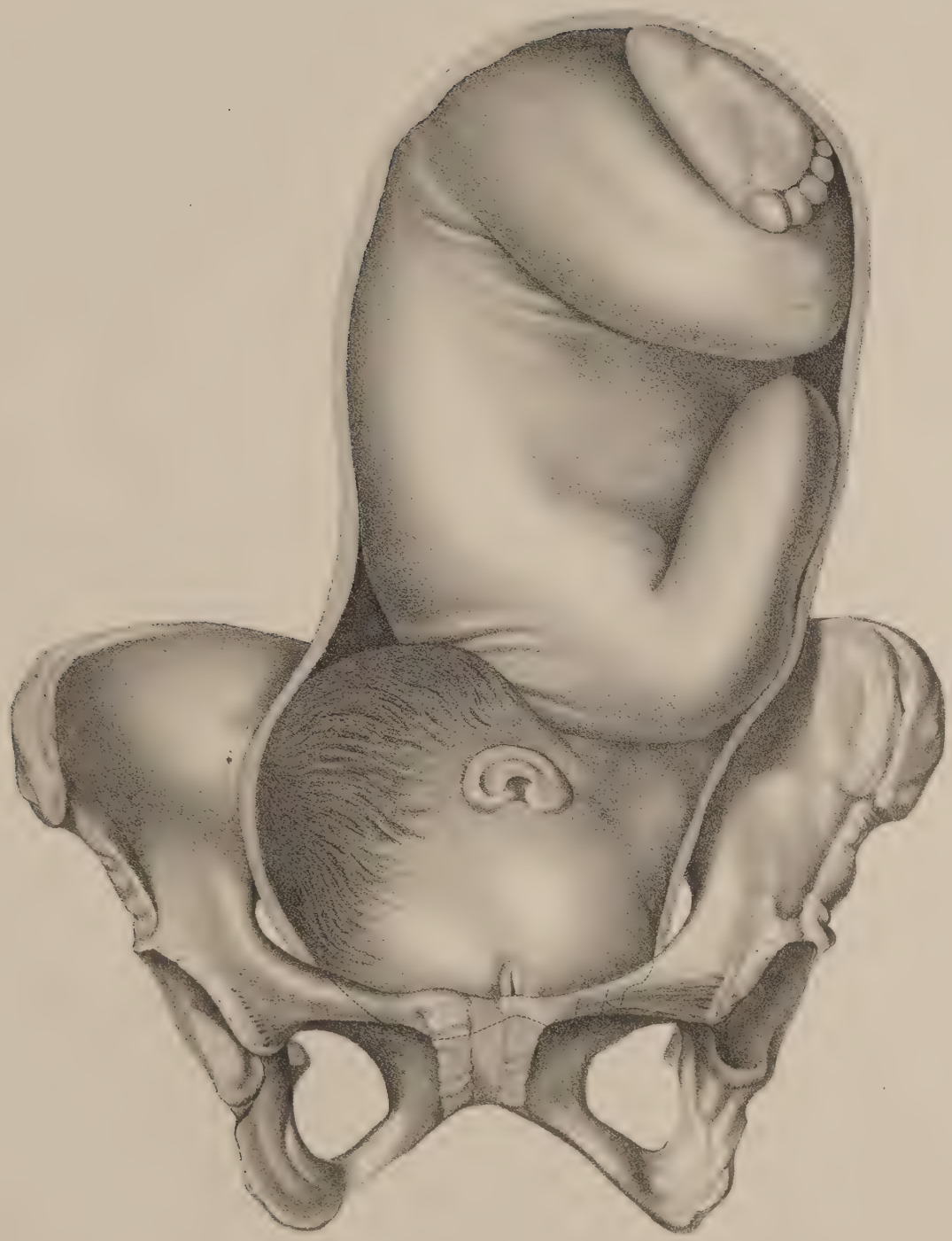


PLATE L.

MECHANISM OF NATURAL LABOR, IN THE SECOND POSITION OF THE FACE. (LEFT MENTO-ILIAC.)

Second period. The head of the fœtus having reached the bottom of the pelvic excavation, has performed a motion of rotation, which has brought the chin from left to right, below and behind the symphysis pubis, whilst the vertex has passed from right to left in the cavity of the sacrum, where it is at this moment lodged. In order to be disengaged, the head must undergo a motion of flexion, during which will be seen to appear, successively, at the vulva, the chin, mouth, nose, eyes, forehead, vertex, and lastly, the occiput.

PLATE LI.

MECHANISM OF NATURAL LABOR, IN THE VARIOUS PRESENTATIONS OF THE PELVIC EXTREMITY.—FIRST POSITION OF THE BREECH. (LEFT SACRO-ILIAC.)

In order not to needlessly multiply Plates, we have given merely one figure of the four positions, which each presentation of the pelvic extremity may assume at the entrance of the pelvis. These four positions being known, it is very easy to apply them.

First position of the breech.—First period. In this position the hips of the fœtus are parallel to the sacro-pubal diameter of the superior strait; the left hip towards the pubes of the mother; the right hip toward the sacrum. The back of the fœtus looks toward the left lateral part of the uterus. The legs and thighs, extended on the anterior part of the fœtus, correspond to the right lateral part of the uterus. The head corresponds to the fundus uteri.

PLATE LII.

MECHANISM OF NATURAL LABOR, IN THE VARIOUS POSITIONS OF THE PELVIC EXTREMITY.—SECOND POSITION OF THE KNEES. (RIGHT TIBIO-ILIAC.)

Second position of the knees.—First period. In this position, the transverse diameter of the knees is parallel to the sacro-pubal diameter of the superior strait; the right knee toward the pubes of the mother; the left knee toward the sacrum. The anterior part of the legs looks toward the right ilium. The feet crossed, and resting against the breech of the fœtus, correspond to the right iliac fossa. The back of the fœtus corresponds to the right lateral part of the uterus. The front of the thighs, the abdomen and whole anterior surface of the fœtus look toward the left lateral part of the uterus. The head flexed, and strongly inclined to the left, corresponds to the fundus uteri, which is in a state of left lateral obliquity.

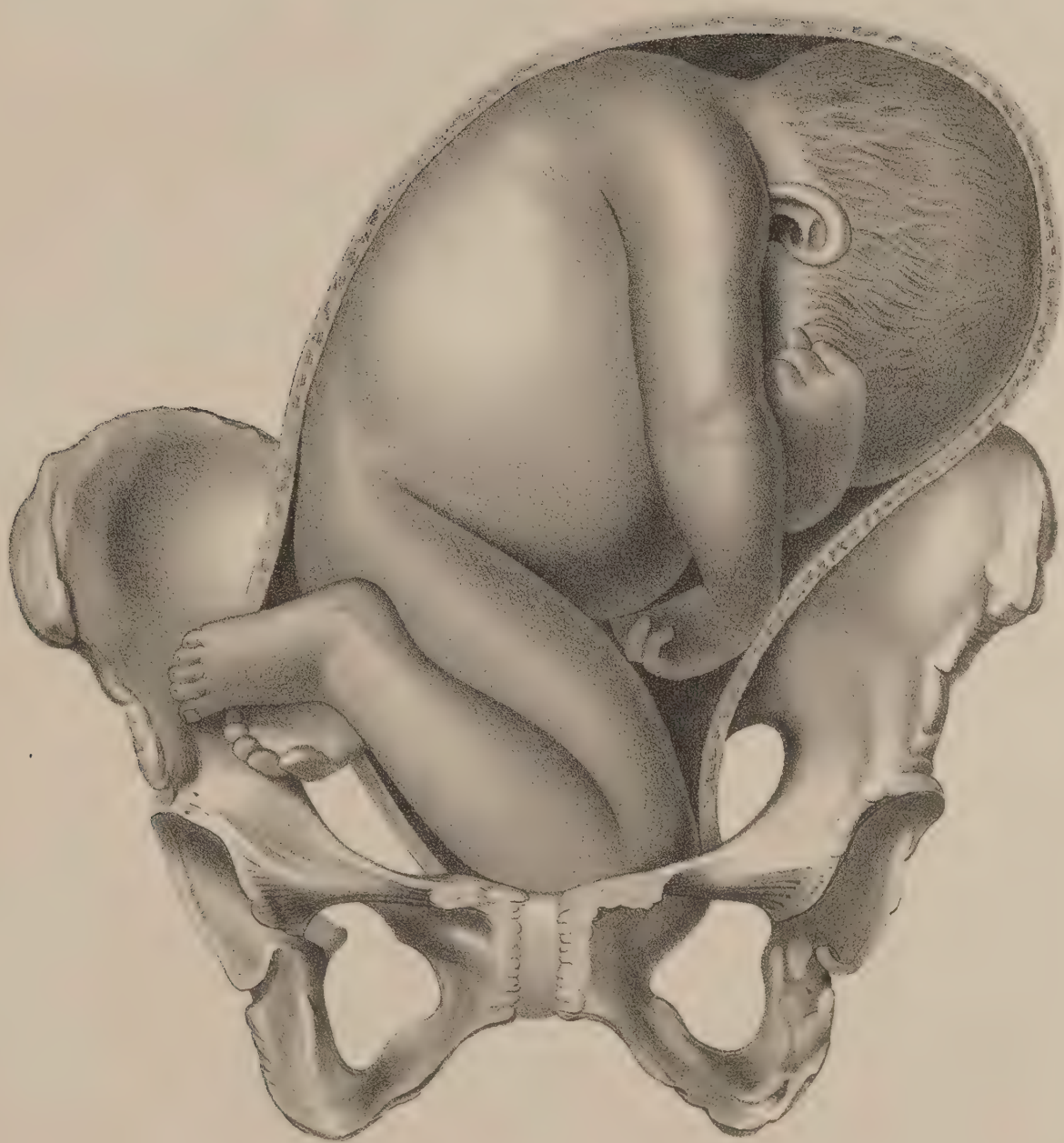


PLATE LIII.

MECHANISM OF NATURAL LABOR IN THE VARIOUS POSITIONS OF THE PELVIC EXTREMITY.—THIRD POSITION OF THE FEET. (CALCANEO-PUBAL.)

Third position of the feet.—First period. In this position the heels of the fœtus correspond to the pubes of the mother. The toes look toward the sacrum. The back of the fœtus corresponds to the anterior surface of the uterus. The front of the legs, knees, arms, and the whole anterior region of the fœtus look toward the posterior paries of the uterus. The left side of the fœtus is directed toward the right side of the mother, and *vice versa*. The head is covered by the fundus uteri.

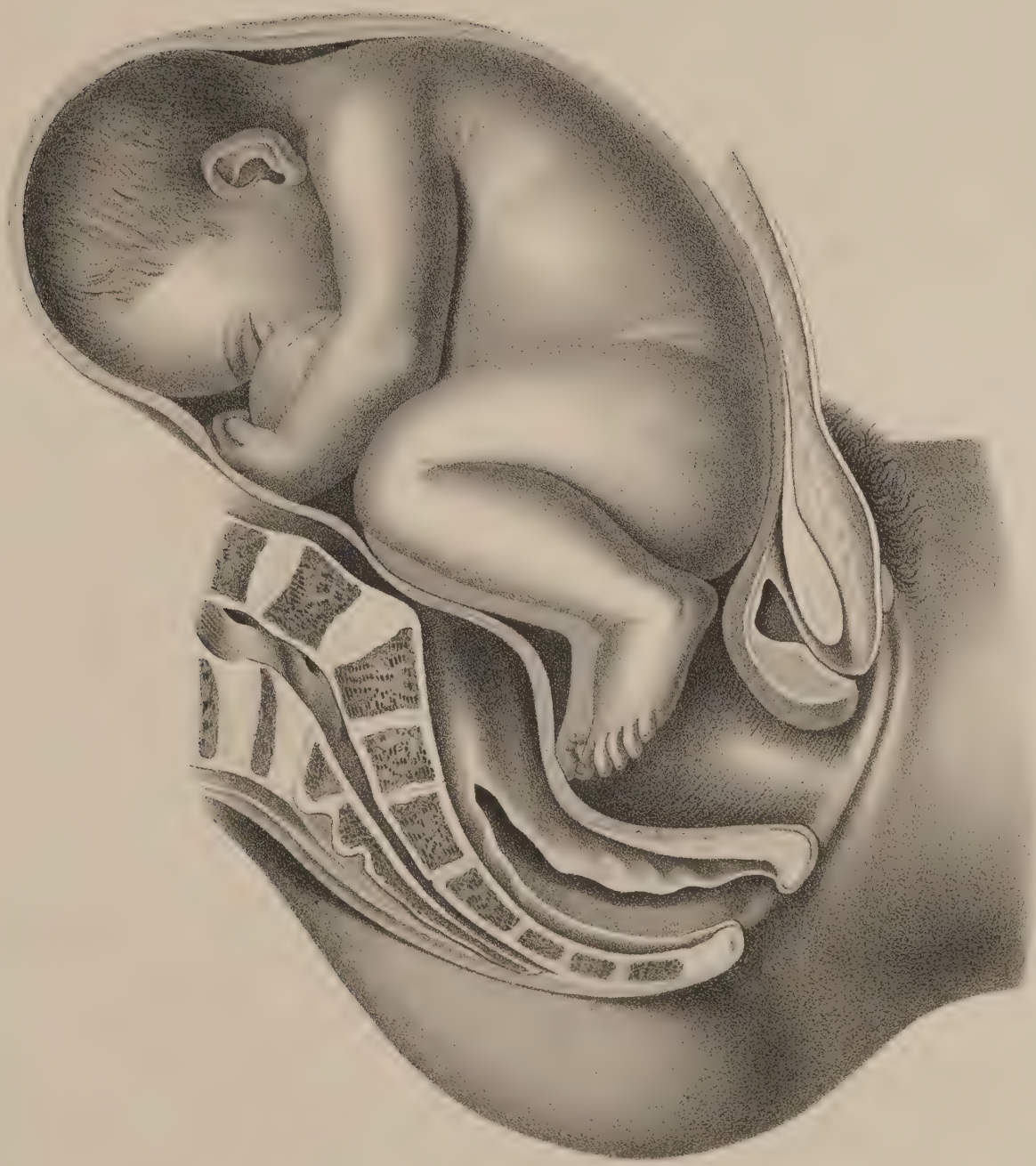


PLATE LIV.

MECHANISM OF NATURAL LABOR IN THE VARIOUS POSITIONS OF THE PELVIC EXTREMITY.—FOURTH POSITION OF THE BREECH. (SACRO-SACRAL.)

Fourth position of the breech.—First period. In this position, the hips of the fœtus are parallel to the bis-iliac diameter of the pelvis. The right hip and right side of the fœtus correspond to the right side of the mother; and *vice versa*. The posterior part of the thighs and legs, and the whole anterior region of the fœtus look toward the anterior paries of the uterus. The sacrum and back of the fœtus correspond to the posterior part of the uterus. The head flexed and inclined forward is covered by the fundus uteri, which is in a state of anterior obliquity.

PLATE LV.

MECHANISM OF NATURAL LABOR, IN THE FIRST POSITION OF THE BREECH. (LEFT SACRO-ILIAC.)

Second period. The breech, impelled by the contractions of the uterus, has passed through the superior strait and descended into the cavity of the pelvis. The left hip, having arrived below the symphysis pubis, engages in the inferior strait and appears at the vulva. The right hip, placed in the cavity of the sacrum, is yet upon the same horizontal line as the left hip. In order to assist the passage of the hips, the trunk of the fœtus will undergo an inflection, of which the cavity corresponding to the pubes of the mother will correspond to the left side, and the convexity to the right. The general relations of the fœtus have not changed, and are still those which we indicated in the first period of this first position of the breech. (Plate 47.)

PLATE LVI.

MECHANISM OF NATURAL LABOR, IN THE FIRST POSITION OF THE BREECH. (LEFT SACRO-ILIAC.)

Third period. The breech has passed through the inferior strait and escaped from the vulva. The left hip of the fœtus appeared first at the vulva, beneath the arch of the pubes, whilst the right hip, in order to reach the exterior, must have traversed the inclined plane formed by the curves of the sacrum, coccyx, and perineum. The trunk has undergone a very decided motion of inflection on the left side.

PLATE LVII.

MECHANISM OF NATURAL LABOR IN THE FIRST POSITION OF THE BREECH. (LEFT SACRO-ILIAC.)

Fourth period. The motion of lateral inflexion has continued during the whole time of the disengagement of the trunk. The shoulders, having reached the superior strait, have engaged in the direction of one of the oblique diameters. The right shoulder is in front of the left sacro-iliac symphysis, and the left shoulder behind the right acetabulum. The right shoulder, after having traversed the whole posterior paries of the pelvis, disengages, in front of the perineum, whilst the left shoulder remains above and behind the right acetabulum. The head begins to descend into the pelvic excavation, and, at the moment of the disengagement of the left shoulder, will undergo a motion of rotation, which will bring the occiput behind the pubes, and the face in the cavity of the sacrum.

PLATE LVIII.

MECHANISM OF NATURAL LABOR IN THE FIRST POSITION OF THE BREECH. (LEFT SACRO-ILIAC.)

Fifth period. The trunk and shoulders of the fœtus are completely disengaged; the head alone remains in the pelvis; it has performed its motion of rotation. The face and vertex are disengaged in front of the perineum, and the occiput will escape last by rolling against and below the symphysis pubis.

PLATE LIX.

ARTIFICIAL LABOR.—VERSION IN THE FIRST OBLIQUE POSITION OF THE VERTEX. (LEFT OCCIPITO-ILIAC.)

Whenever version becomes necessary, after having placed the woman in a proper position, the uterus should be kept fixed by one hand applied to the abdomen of the woman and on the fundus of the organ.

First period. In this position, the left hand must be introduced on the right side of the pelvis, in a state between pronation and supination, and made to follow the direction of the right sacro-iliac symphysis, so that the palm of the hand may be applied to the vertex of the fœtal cranium, in order to raise up the head, remove it from the superior strait, and carry it as far as possible toward the left iliac fossa.

PLATE LX.

ARTIFICIAL LABOR.—VERSION IN THE FIRST POSITION OF THE VERTEX. (LEFT OCCIPITO-ILIAC.)

Second period. After having raised the head, the hand must be introduced between the left side of the cranium and the posterior part of the uterus, and made to follow the whole of the left side of the fœtus, taking care to distinguish successively each of the parts constituting it, until the hand reaches the feet.

During the whole of this period, the right hand, which is external, should incline the fundus uteri to the right, and bring the feet as near as possible toward the hand which is to grasp them.

PLATE LXI.

ARTIFICIAL LABOR.—VERSION IN THE FIRST OBLIQUE POSITION OF THE VERTEX. (LEFT OCCIPITO-ILIAC.)

Third period. In this position, the left hand seizes the two feet, and extends the legs upon the thighs in order to commence the motion of version.

PLATE LXII.

ARTIFICIAL LABOR.—VERSION IN THE FIRST OBLIQUE POSITION OF THE VERTEX. (LEFT OCCIPITO-ILIAC.)

Fourth period. The two legs are extended, the feet grasped so that the thumb rests above the external right malleolus, the middle finger on the external left malleolus, and the index between the legs, above the internal malleoli.

The operator takes advantage of the interval between the contractions of the uterus to draw on the feet and execute the motion of version.

PLATE LXIII.

ARTIFICIAL LABOR.—VERSION IN THE FIRST OBLIQUE POSITION OF THE VERTEX. (LEFT OCCIPITO-ILIAC.)

Third period, (*bis.*) When in the third period, the hand has been able to grasp and bring to the orifice of the uterus only one foot, in order to bring down the other, the first must be secured by the fillet, and the left hand again introduced along the internal part of the disengaged limb.

PLATE LXIV.

ARTIFICIAL LABOR.—VERSION IN THE FIRST OBLIQUE POSITION OF THE VERTEX. (LEFT OCCIPITO-ILIAC.)

Fifth period. The feet and legs have escaped from the vulva; the right hand has grasped the right leg, given it a motion from before backward, and from right to left, and brought the right hip of the fœtus behind the anterior left inclined plane of the pelvis, whilst the left hand, which has grasped the left leg, has given to this limb an opposite motion; that is, it has directed it from behind forward, and from left to right, in order to place the left hip in front of the right sacro-iliac symphysis; and, in this position, to assist the disengagement and passage of the hips through the pelvis.

PLATE LXV.

ARTIFICIAL LABOR.—VERSION IN THE FIRST OBLIQUE POSITION OF THE VERTEX. (LEFT OCCIPITO-ILIAC.)

Sixth period. The hips have escaped from the vulva, the hands have grasped them; the thumbs are applied to the sacrum of the fœtus; the fingers are extended along the anterior part of the thighs, so that the radial edge of the index finger is parallel to the horizontal ramus of the pubes, and rests upon it, in order not to compress the abdominal viscera of the fœtus.

The hips being thus grasped, gentle tractions should be exerted on the trunk of the fœtus, by directing successively and alternately, by a motion of elevation and depression, the right hip of the fœtus toward the left groin of the mother, and the left hip toward the posterior part of the mother's right thigh.

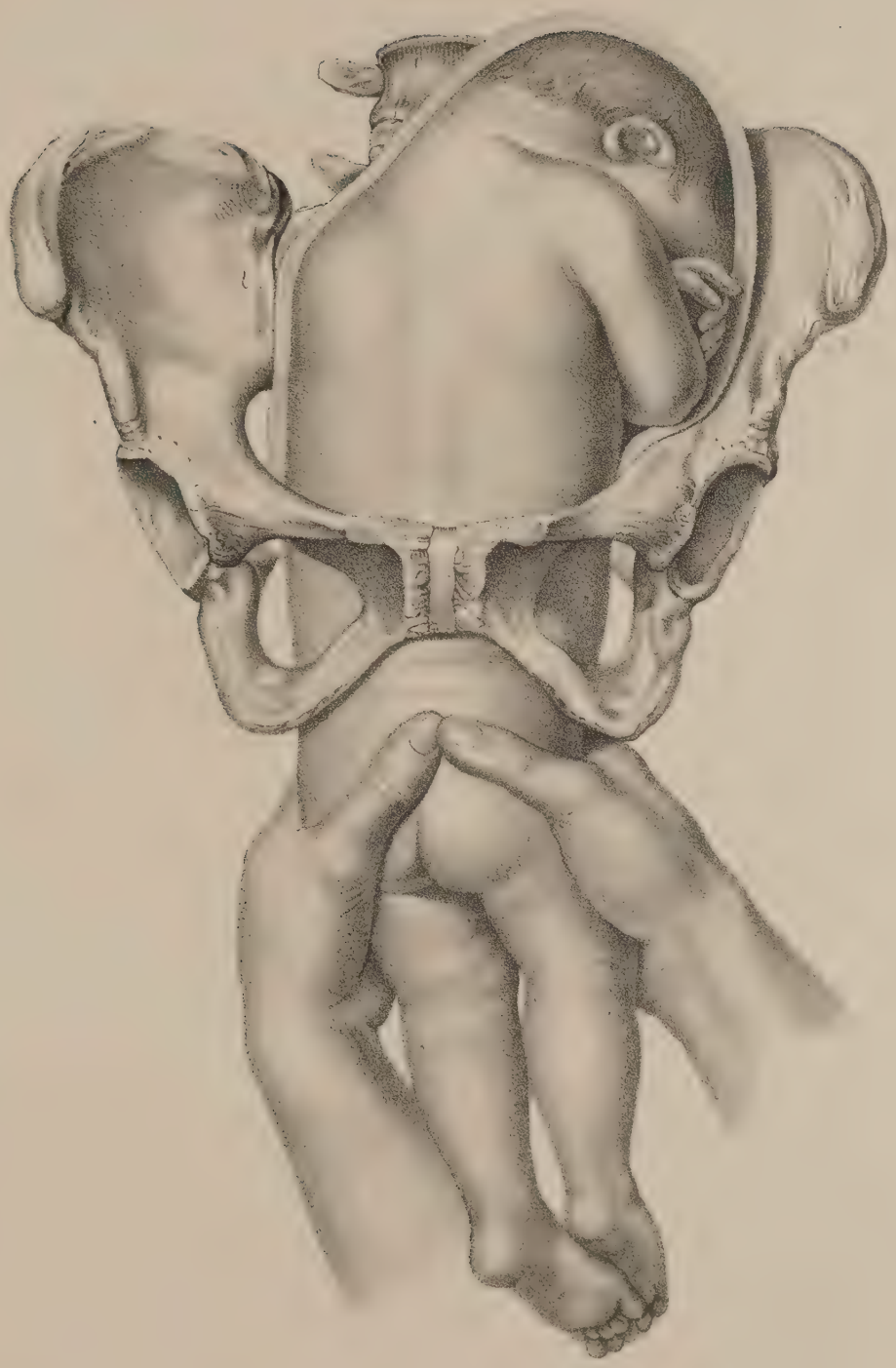


PLATE LXVI.

ARTIFICIAL LABOR.—VERSION IN THE FIRST OBLIQUE POSITION OF THE VERTEX. (LEFT OCCIPITO-ILIAC.)

Seventh period. The umbilicus of the fœtus has passed through the vulva. The left hand, resting on the left side of the fœtus, supports and elevates the trunk; the index and middle finger of the right hand seize the cord near its insertion at the umbilicus, draw it externally, and form a loop sufficiently large to prevent its being torn during the disengagement of the rest of the trunk.

PLATE LXVII.

ARTIFICIAL LABOR.—VERSION IN THE FIRST OBLIQUE POSITION OF THE VERTEX. (LEFT OCCIPITO-ILIAC.)

Eighth period. The trunk of the fœtus is entirely expelled from the pelvis, with the exception of the shoulders and arms, which are still retained in it. In order to disengage the latter, the right hand, applied to the left side of the fœtus, raises the trunk and carries it to the arch of the pubes, by inclining it, as much as possible, toward the belly and left side of the mother. The index and middle fingers of the left hand are placed along the posterior and left lateral part of the thorax of the fœtus, depress the shoulder and disengage the left arm, which is applied to the left side of the head.

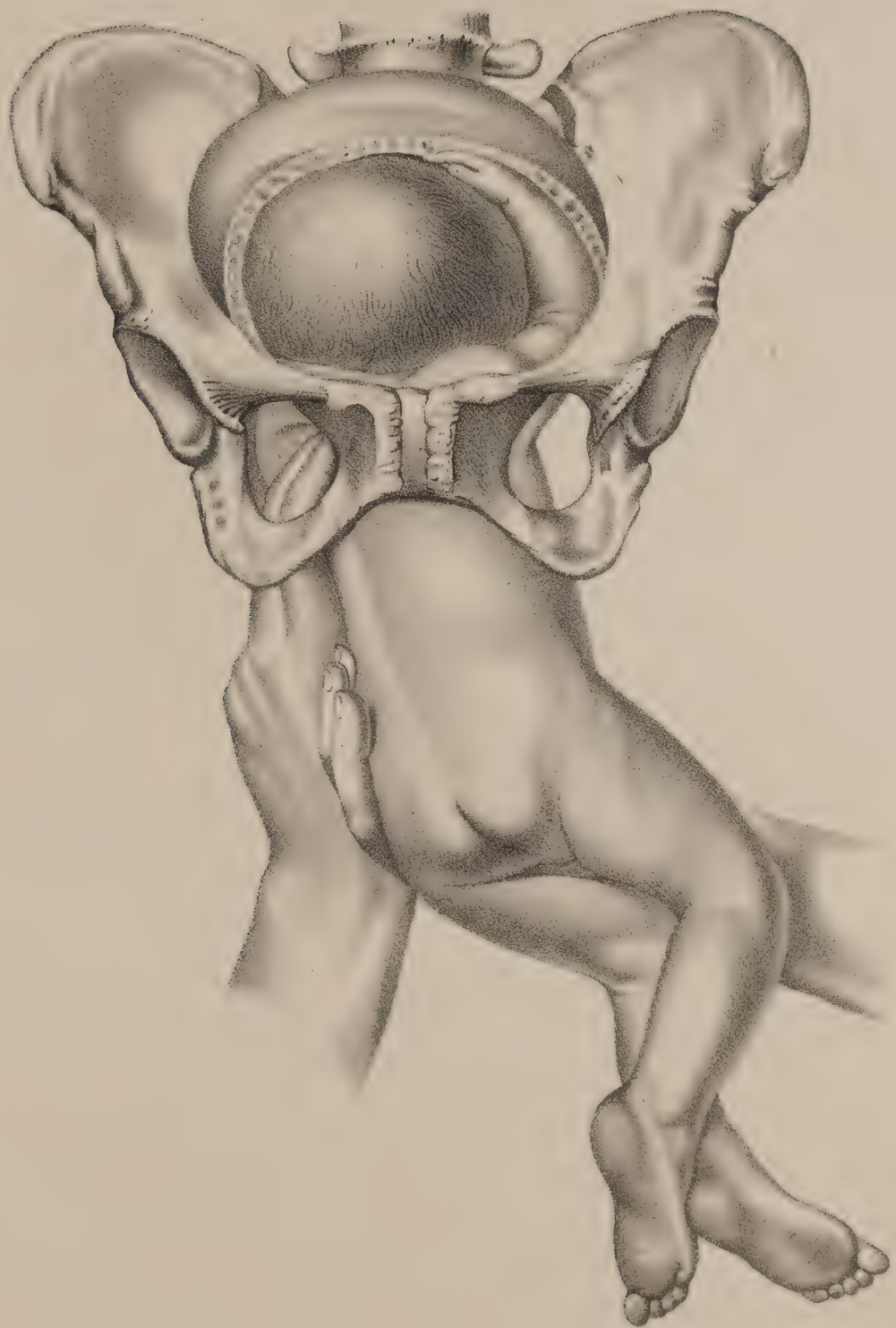


PLATE LXIX.

ARTIFICIAL LABOR.—VERSION IN THE FIRST OBLIQUE POSITION OF THE VERTEX. (LEFT OCCIPITO-ILIAC.)

Tenth period. The arms being disengaged, the right hand and forearm of the operator passed between the legs of the fœtus, support the trunk and incline it toward the belly of the mother; whilst the left hand, introduced into the cavity of the pelvis, grasps the face of the child, which is directed toward the left side of the pelvis, in order to bring it in the cavity of the sacrum.

PLATE LXX.

ARTIFICIAL LABOR.—VERSION IN THE FIRST OBLIQUE POSITION OF THE VERTEX. (LEFT OCCIPITO-ILIAC.)

Eleventh period. In order to disengage the head, the anterior part of the thorax of the fœtus rests on the palmar surface of the left hand, and the index finger of the latter is placed in the mouth of the fœtus in order to maintain the head in a state of flexion. The index and ring fingers of the right hand, placed on the back of the fœtus, are flexed on the shoulders in the shape of hooks, whilst the extended middle finger rests on the inferior part of the occiput, in order to prevent the too early departure of the chin from the breast; then the trunk of the child will be brought from below upward, from behind forward, and strongly inserted on the belly of the mother; whilst the face, forehead, and all the parts constituting the vertex will traverse successively the curve formed by the sacrum, coccyx, and perineum, and escape from the vulva.

PLATE LXXI.

ARTIFICIAL LABOR.—PRESENTATIONS OF THE SHOULDERS AND ARMS.

First position of the right shoulder (left acromio-iliac) and of the right arm.

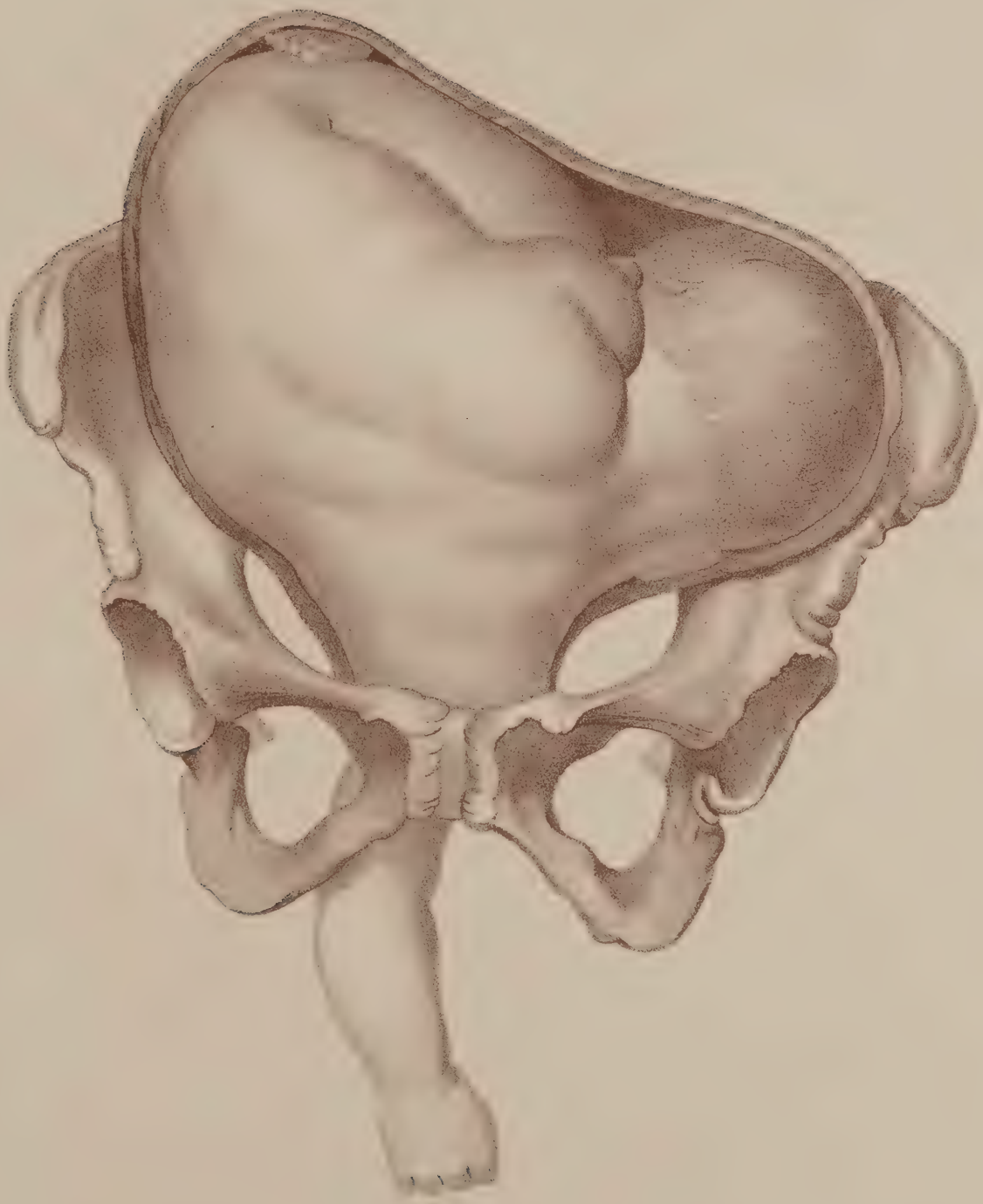


PLATE LXXII.

ARTIFICIAL LABOR.—PRESENTATIONS OF THE SHOULDERS AND ARMS.

Second position of the right shoulder (right acromio-iliac) and of the right arm.

PLATE LXXIII.

ARTIFICIAL LABOR.—PRESENTATIONS OF THE SHOULDERS AND ARMS.

First position of the right shoulder and right arm.—First period. A fillet is fastened to the arm in order that it may be brought on the side of the trunk, when the feet are disengaged and the version accomplished. The right hand, introduced on the left side of the pelvis, grasps the right side of the thorax of the fœtus, raises and removes it from the superior strait, in order to be able to pass between the internal surface of the uterus and the right side of the fœtus, in order to reach successively the breech and feet, whilst the left hand, applied externally, prevents the ascent of the uterus, and tends to depress and bring near to the right hand the feet which are to be grasped by the latter.

PLATE LXXIV.

ARTIFICIAL LABOR.—PRESENTATIONS OF THE SHOULDERS AND ARMS.

Second position of the right shoulder and arm.—Third period. The right hand has grasped the feet of the fœtus and is about to bring them to the vulva, whilst the left hand, placed externally, depresses the breech of the fœtus in order to assist the incipient motion of version. At the same time, the forearm and hand of the foetus, which had escaped from the vulva, ascend slightly, and have a tendency to re-enter the mother's organs.

PLATE LXXV.

ARTIFICIAL LABOR.—PRESENTATIONS OF THE SHOULDERS AND ARMS.

Second position of the left shoulder and arm.—Second period. The left hand, after having traversed the whole of the left side of the fœtus, has reached the feet, which it is about to grasp, whilst the right hand, applied externally, depresses the fundus uteri, and pushes the breech of the fœtus from left to right, to assist the motion of version.

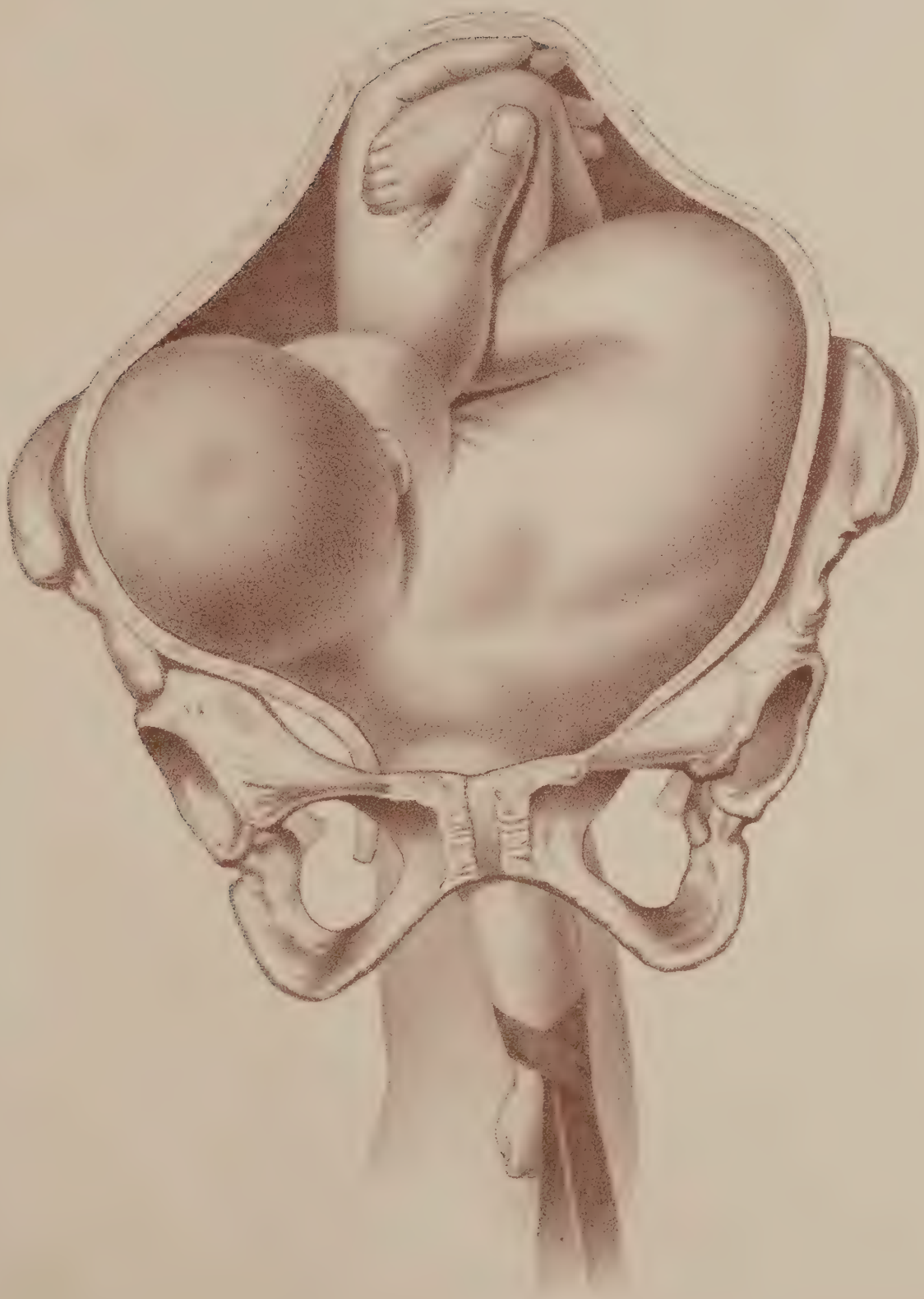


PLATE LXXVI.

ARTIFICIAL LABOR.—PRESENTATIONS OF THE SHOULDERS AND ARMS.

Second position of the left shoulder and arm.—Fourth period. The left hand has grasped the feet and brought them to the vulva; the motion of version is terminated; the right hand draws gently on the fillet in order to apply the left arm against the corresponding side of the fœtus.

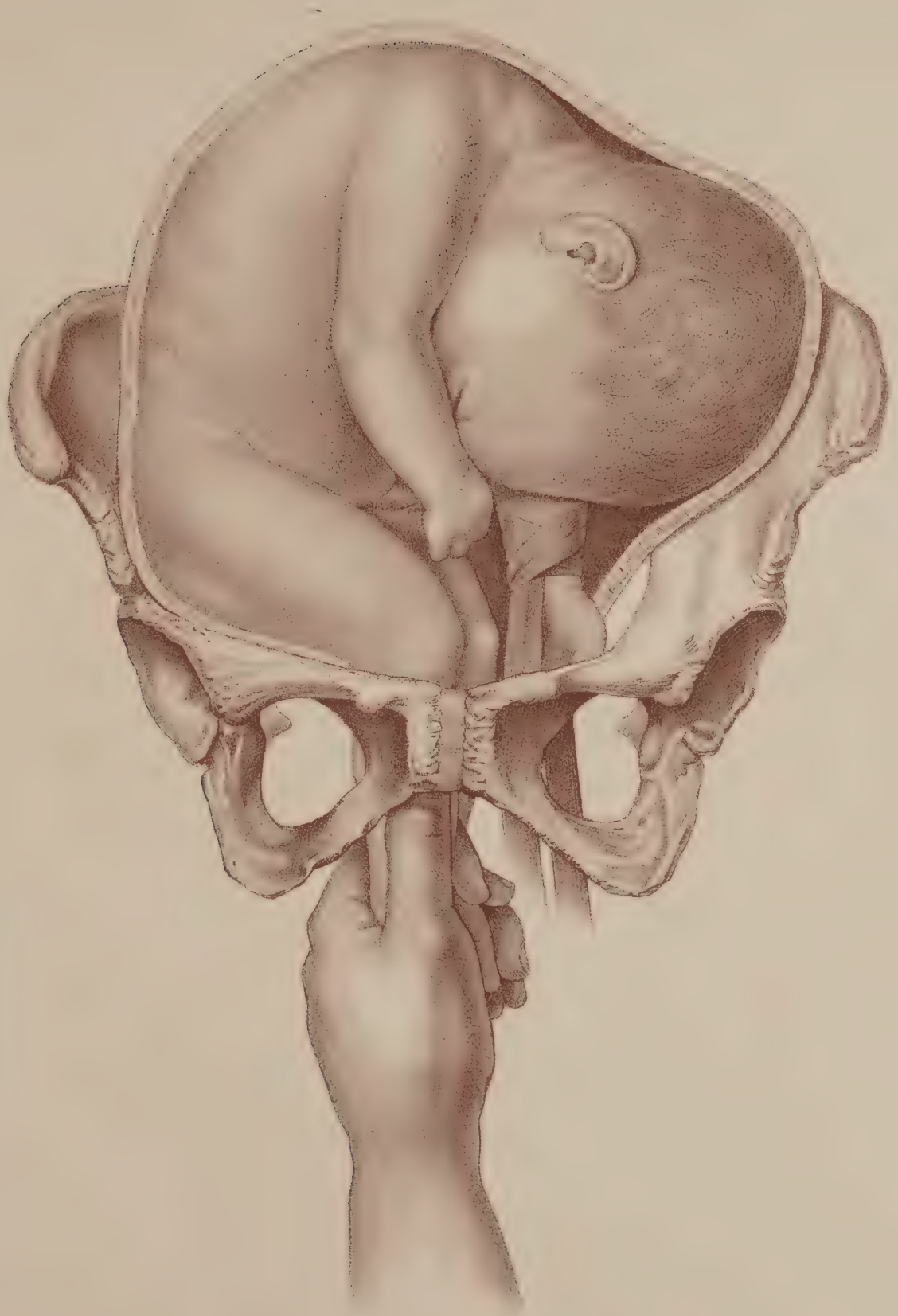


PLATE LXXVII.

ARTIFICIAL LABOR.—APPLICATION OF THE FORCEPS.

Application of the forceps in the particular cases in which the head has escaped through the os uteri, descended into the cavity of the pelvis, and the occiput is behind the symphysis pubis and the forehead, in the cavity of the sacrum, or reciprocally.

A, The left hand having seized the male blade of the forceps, presents the extremity of the claw to the vulva, and is about to introduce it into the sexual organs.

B, Three fingers of the right hand placed between the left side of the vulva and the head of the fœtus, in order to serve as a guide for the male blade.

PLATE LXXVIII.

ARTIFICIAL LABOR.—APPLICATION OF THE FORCEPS.

A, The male blade introduced and supported by an assistant.
B, The female blade, grasped by the operator's right hand, is to be introduced on the right side of the pelvis, above the male blade, already applied.
C, Three fingers of the left hand, placed between the right side of the vulva and the head of the fœtus, in order to serve as a guide for the female blade.

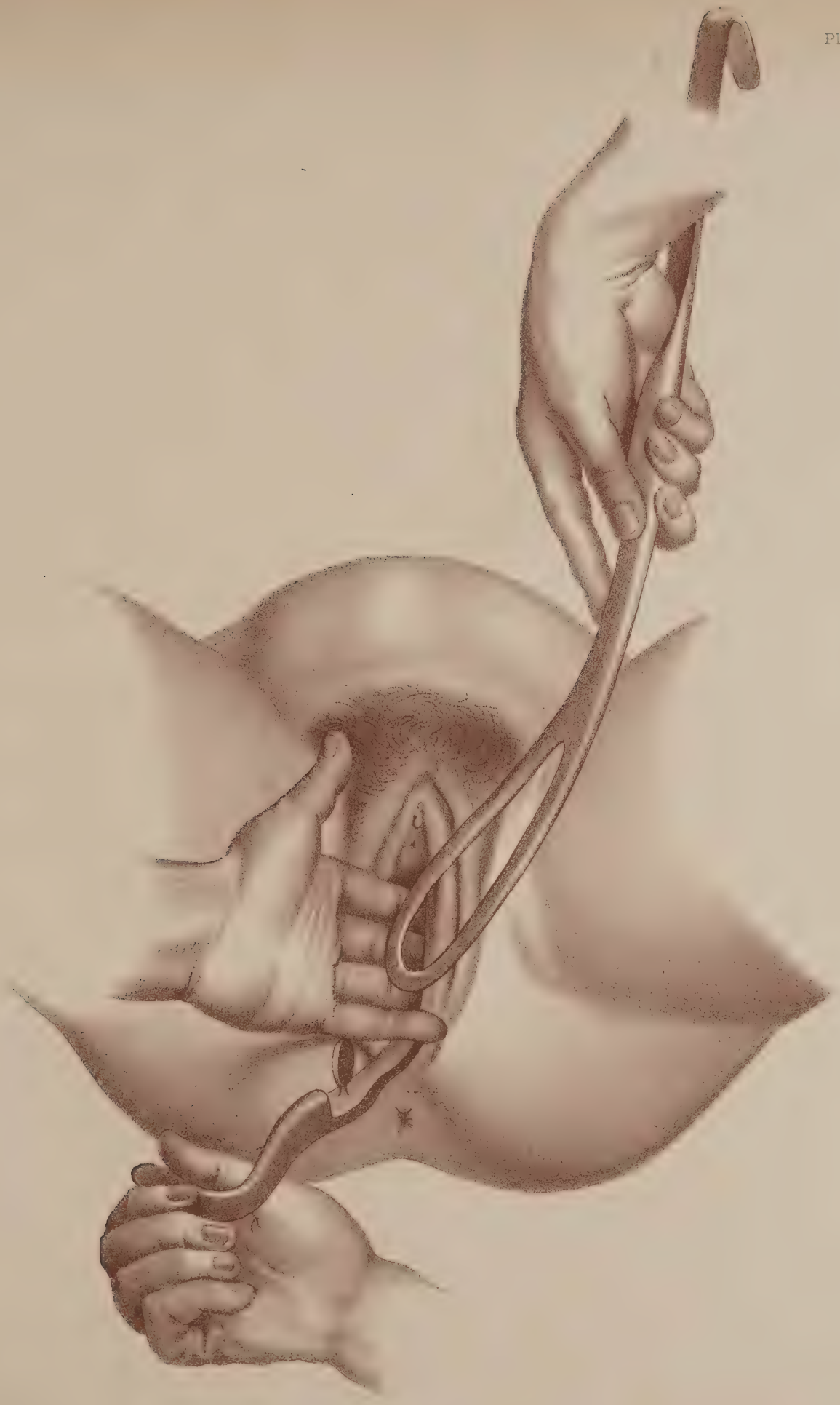


PLATE LXXIX.

THE FORCEPS APPLIED AND LOCKED.

PLATE LXXX.

ARTIFICIAL LABOR.—APPLICATION OF THE FORCEPS.

Fig. 1, The forceps are applied; the two blades locked, the head properly grasped, and the degree of pressure regulated by a fillet. The hands have seized the instrument; the left at the junction of the blades, the right, at the extremity of the handles and below the hooks, will perform the motions of traction and vascillation, in order to bring the occiput below the symphysis pubis and outside of the vulva.

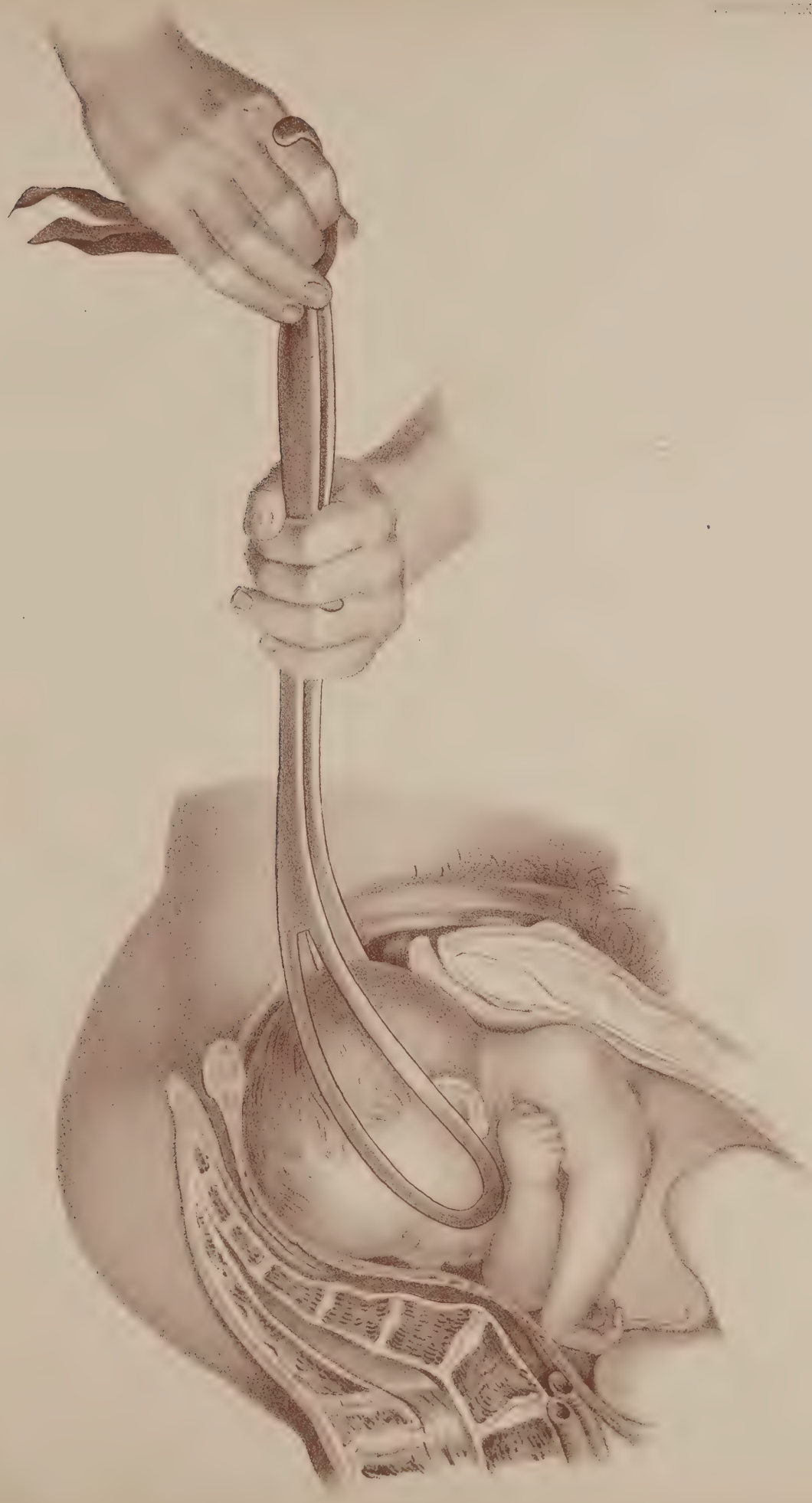


PLATE LXXXI.

ARTIFICIAL LABOR.—APPLICATION OF THE FORCEPS.

As soon as the occiput has passed beyond the arch of the pubes, the hands, by continuing the motions of traction and vascillation, have slowly elevated the handles of the forceps, so as to bring them toward the mother's belly. During this period, the head has executed a motion of extension, which has caused the occiput to ascend in front of the symphysis pubis, whilst the forehead and face have slipped and been disengaged in front of the posterior commissure of the vulva.

PLATE LXXXII.

ARTIFICIAL LABOR.—APPLICATION OF THE FORCEPS.

Fig. 1, Application of the forceps in the left occipito-acetabular position. (The head preserving the oblique position.)

The male blade is placed to the left and rear in the direction of the left sacro-iliac symphysis, and rests on the left side of the head of the fœtus. The female branch is placed obliquely in front and to the right of the pelvis on the right side of the head of the fœtus. The blades being locked, the pivot is then in the direction of the fold of the left groin of the woman. The hands, having grasped the instrument, carry the handles of the forceps obliquely from below upward, from the left forward, so as to bring the occiput behind and below the symphysis pubis.

Fig. 2, Circular pessary, called pessary *en gimblette*.

Fig. 3, Pessary with a projecting edge, devised by M. Moreau, and first used in certain cases of anteversion and retroversion of the uterus.

PLATE LXXXIII.

ARTIFICIAL LABOR.—APPLICATION OF THE FORCEPS.

Fig. 1, Application of the forceps above the superior strait.

The head of the fœtus, having the occiput above the symphysis pubis, and the forehead above and in front of the promontory of the sacrum, is grasped by the forceps. The blades are locked, and the degree of pressure determined. The right hand has seized the ends of the handles above the hooks; the index finger of the left hand, below and within the point of junction, is placed in the interval between the claws, and extended so as to touch the vertex of the fœtal head, in order to judge if it obeys the various motions which will be given to it.

Fig. 2, Circular pessary.

Fig. 3, Oval-shaped pessary.

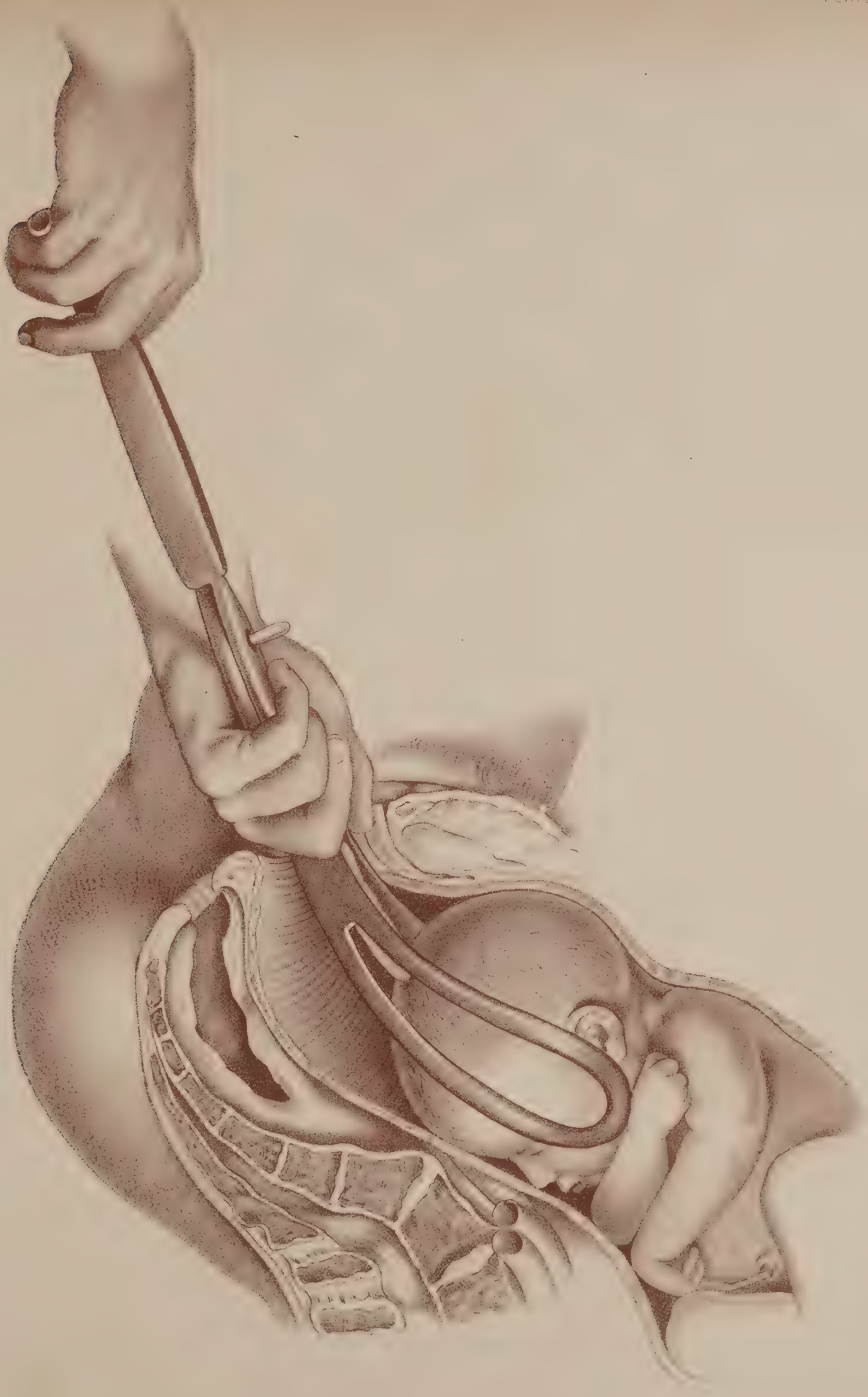


PLATE LXXXIV.

ARTIFICIAL LABOR.—APPLICATION OF THE FORCEPS.

Fig. 1, Application of the forceps, the body of the fœtus being without the vulva, the head descended in the pelvic excavation, the face lodged in the cavity of the sacrum, and the occiput behind the symphysis pubis.

Fig. 2, Application of the forceps, the body of the fœtus being without the vulva, the head retained at the superior strait, the face directed backward, and above the symphysis pubis, and the occiput in front of the promontory of the sacrum.

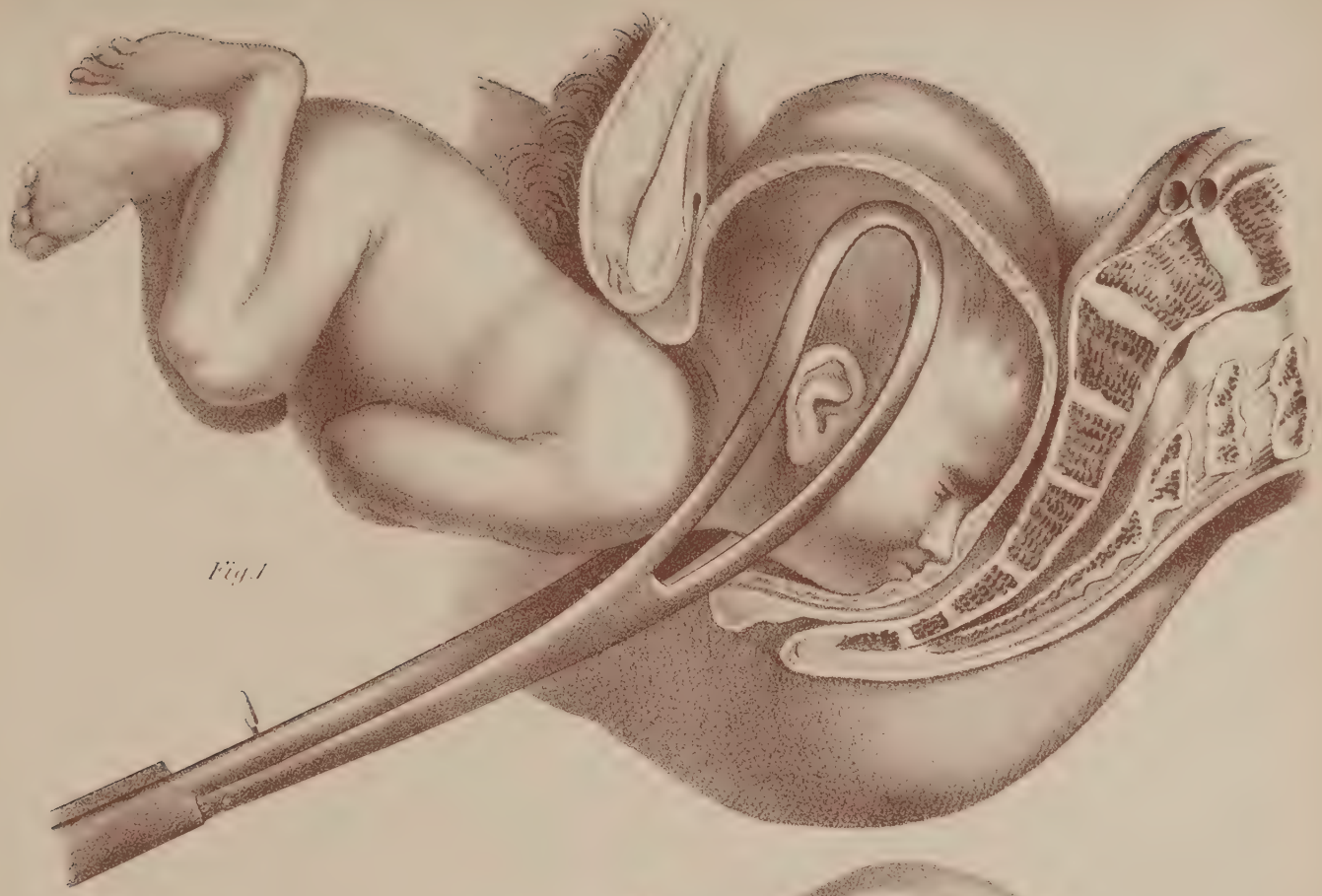


Fig. 1

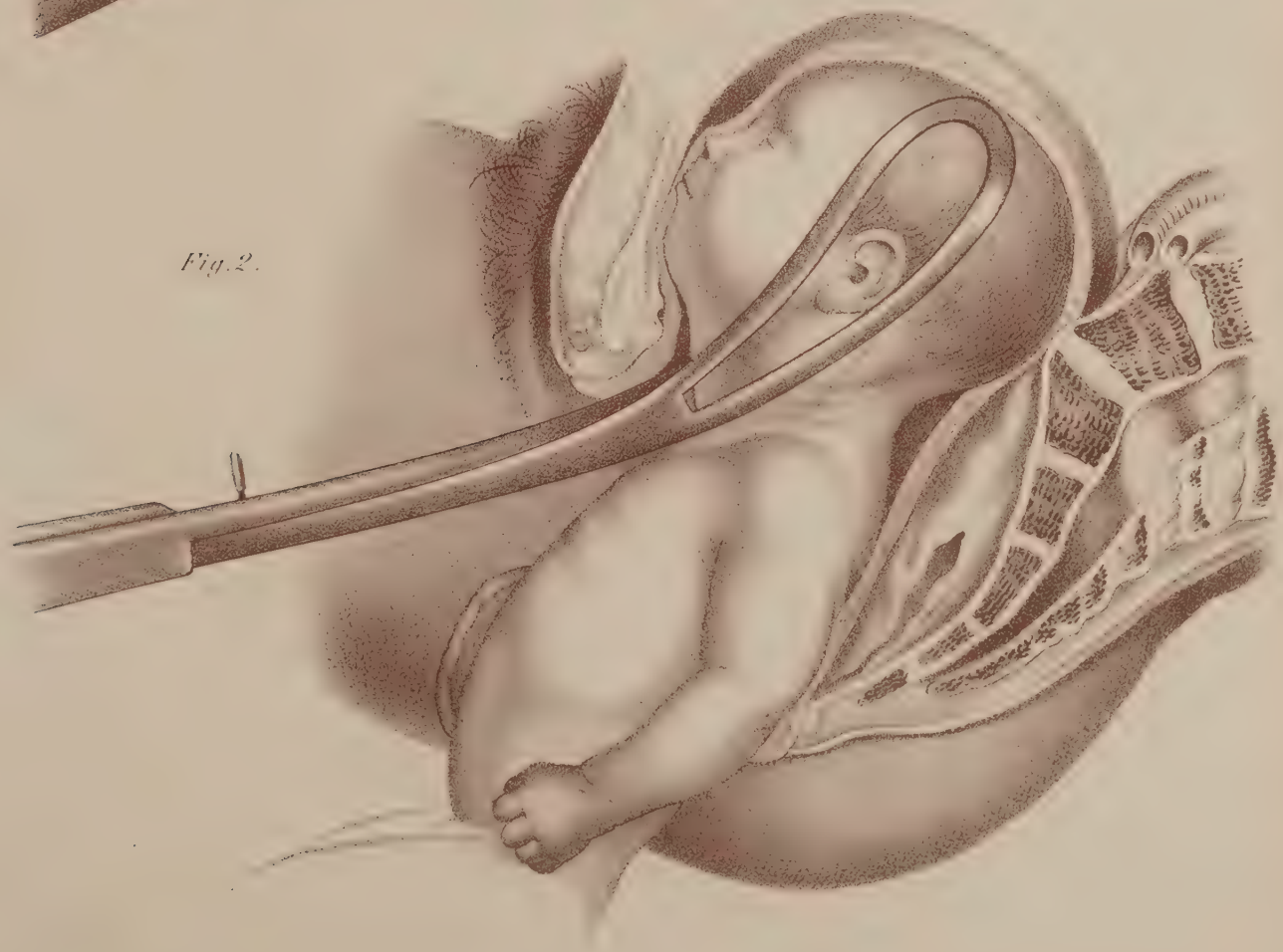


Fig. 2.

THE ILLUSTRATED ENCYCLOPÆDIA OF OBSTETRICS.

CHAPTER I.

INTRODUCTORY.—*LEISHMAN.*

The History of Midwifery is to the student of that art a subject not only interesting, but also in some degree instructive. To trace from their earliest development, whether in the crude ideas of ancient times, or in the hasty generalizations of an epoch not far distant from our own, the growth and maturity of theories which we now believe to be in accordance with the truth, is indeed in itself an attractive pursuit; and the student has his reward in the thorough mastery he thus obtains over details, which can scarcely be effected by the mere dogmatism of ordinary teaching.

For various and evident reasons, however, the history of the obstetric art cannot be embraced fittingly within the limits which must be fixed for matter purely introductory to the study of a great practical subject. Not even in outline, then, will a consecutive history of midwifery be attempted; but, as reference will in the sequel be not unfrequently made to the doctrines and practice of the past, a few sentences may here be devoted to the consideration of the midwifery of certain epochs, in view of the influence which these may be supposed to exercise on the practice of the present day.

From the earliest records, more or less authentic, which seem to throw light upon the subject, it would appear that the practice of midwifery was in the first ages entirely in the hands of women. If we may judge, however, from the fact that a law was passed in Athens, at a very early period, by which women were absolutely prohibited from practising physic in any of its branches, we are entitled to assume that the art had not in the main prospered in their hands. It is in the Hippocratic writings that we find the first trace of a profound intellect and a truly scientific mind being applied to the observation of the phenomena of parturition. The works, indeed, on this subject, which are attributed to Hippocrates, are, for the most part, passed over as unauthentic by modern critics; but there can at least be no doubt that they were written before Aristotle, at the latest, we may assume, about 400 B. C. The head, according to the former authority, is the only natural presentation, and when the child either lies across, or presents by the feet, the woman cannot be delivered. Observe the effect of this aphorism. The head being thus assumed to be the only presentation in which the natural forces could effect delivery, it follows, as the natural corollary of this proposition, that one of the chief aims of operative midwifery must be to convert breech and footling, as well as transverse presentations, into presentations of the head. The contemplation of such a state of practice is too horrible to dwell upon. His graphic illustration of the olive in the neck of the oil jar is familiar to all, and demonstrates to perfection that it can, in its long diameter, be easily passed through; "but," he adds, "if the long diameter of this oval body be thrown across, either the bottle will break or the olive will be crushed." It is strange, indeed almost incredible, that, having recognized the form of the fœtus while in the womb, as this simile clearly shows, he should have failed to perceive that an oval body, be it olive or fœtus, may pass by either end of its long diameter. Overlooking this fact, he established a rule of practice, which obtained in after ages, as there is every reason to believe, for a period little short of two thousand years, at what expense of maternal and fœtal life it is impossible to compute. From this early period we must also date the operation of craniotomy, for the performance of which quite intelligible rules are given.

This error of Hippocrates was corrected by Aristotle and subsequently by Celsus; but it is to the latter that the credit in this matter is usually ascribed by the commentators, as his words are clear and free from ambiguity. This is manifest from the following sentence alone, extracted from the instructions given by him for the management of transverse cases: "Medici vero propositum est, ut eum manu dirigat, vel in caput, *vel etiam in pedes*, si forte aliter compositus est."

Some four or five hundred years later, a careful compilation of all that had been written up to that time on the subject of midwifery was made by Ætius. Among the untoward circumstances detailed as causes of difficult labor, he mentions a narrow pelvis, the presence of polypi, and obliquity in the position of the womb. He states, further, that an anchylosis of the *ossa pubis* at their point of junction is a fertile cause of difficult labor, by preventing the separation which would otherwise, he supposes, occur; and that distention of the rectum or bladder may constitute a mechanical impediment to delivery. He observes, also, that difficult labor is due as well to a faulty condition of the child as of the maternal parts. If the child, or any of its parts, were unduly large, labor was presumed to be impeded by the fact that the motions and leaping of the child (supposed, even in comparatively modern times, to contribute greatly to its delivery), were thereby interfered with. Many other points of interest and of practical importance are referred to by him, one or two of which may be noticed. We have here, for example, in a chapter, "De Fœtüs Extractione ac Exsectione," which he takes from Philumenus, the first indication of the speculum vaginæ in an instrument which he recommends for the purpose of separating the external parts, in order to bring the

cause of obstruction into view. We have also a perfect description of the crotchet (*uncinus attractorius*); and in his description of a method of delivery by the application of two crotchets—one to each side of the head—we cannot fail to observe that the mechanical principle of the midwifery forceps was not only then adopted in practice, but was thoroughly understood by the author, and brought him very near to the discovery of the forceps of modern times. And, finally, we have here the operation of turning in cases of difficult cranial presentation recommended, in terms which place it beyond a doubt that the procedure indicated is in all respects identical with what of late years has been introduced in similar cases, as a novelty and an improvement in modern practice. The credit of the discovery and demonstration of the Fallopian tubes was claimed by Galen, but there is no doubt that they were described at a still earlier period than the epoch now in question by Rufus Ephesius, who lived in the reign of Trajan (*circa*, A. D. 110). The last writer on this subject of the old Greek school was Paulus Ægineta, to whose works little originality can be attributed.

The favor in which literature and the sciences were held by the Arabs evidently exercised a most beneficial influence in the development of the Arabian School of Midwifery. The name of Rhazes, a physician of Bagdad towards the end of the ninth century, is associated with the discovery of the fillet. About a hundred years later a very remarkable and voluminous series of works on midwifery and allied subjects was given to the world by Avicenna, a physician of Ispahan. His works consist for the most part in a confirmation of the leading views of the Greek school, and as they enjoyed an extraordinary popularity in Europe, as well as in Asia, it was by this channel mainly that the errors of the ancients were diffused throughout the world. The fundamental error of Hippocrates he adopts in a modified degree. All presentations, says he, except the head, are preternatural; the head ought, therefore, to be brought, in all such cases, into the natural position, but, should this be impracticable, we may deliver by the feet. He recommends in certain cases the use of the fillet, which, when used for extraction, is to be fixed over the head; and, should this fail, *the forceps* is to be applied to the head and extraction then attempted, while as a last resource only are the perforator and crotchet to be employed.* A reference to this passage makes it perfectly clear that the instrument alluded to is essentially the midwifery forceps; while the fact that the author nowhere describes the instrument as a novelty warrants us in the belief that, about the tenth century, or possibly at an earlier period, the use of this important instrument was familiar to the Arabian physicians. In the works of a later writer, of the eleventh or twelfth century,† the forceps then used in midwifery is described and delineated. It is represented under two different forms, the *misdach* and the *almisdach*. In the Arab original in the Bodleian Library at Oxford to which Smellie refers in his learned introduction, the former of these is described as straight and the latter as curved, but in the Latin version both are described as circular and full of teeth.

From this period, until the invention of printing in the middle of the fifteenth century diffused a knowledge of the writings of the ancients throughout the civilized world, our art seems to have made but little progress. Indeed, we may even say with truth, that, after the decline of learning in the East, the art of midwifery, as practised in Europe, was far inferior to what obtained among the Arabians and even among the later Grecian writers. This we may easily understand if we reflect that Hippocrates was the text-book in the hands of all, and that his errors continued to influence the practice of midwifery until the dawn of science, after the dark ages of our art, dissipated in some measure the mists of ignorance and superstition.

In 1518, Dr. Linacre, physician to Henry VIII., obtained, through his interest with Cardinal Wolsey, letters-patent constituting a corporate body of regular physicians in London. This foundation of the Royal College of Physicians of England marks the period at which midwifery, for the first time in this country, was brought within the domain of science. It must be confessed, however, that the earliest efforts of English authors contributed but little to the advancement of the art, as founded upon true scientific principles. The first English work on the subject was a translation of Eucharius Rhodion, by Dr. Raynalde, under the title of "The Byrthe of Mankynde."‡ That this work was held in no little repute on the Continent is evident from the fact that it had been translated from the original High Dutch, not only into Latin, but also into Dutch, French, Spanish, and other languages. And yet, when we examine it critically, we find that, except as a literary curiosity, it scarcely merits our attention. Not only does he indorse the famous blunder of Hippocrates, by saying that we should turn the child to the natural position even when the feet present, but he boldly promulgates another error when he says that, when the child presents in the natural way by the head, the face and foreparts of the fœtus are towards the foreparts of the mother. In most other respects his views are but copies from the ancient writers. The same remark may be made with reference to the productions of his contemporaries, as we find doctrines which are essentially the same promulgated in the collection of monographs, memoirs, and reproductions from ancient and modern sources, by Israel Spachius, known as the "Gynæciorum Commentaria,"§ a collection familiar to all who have investigated this subject. A very superficial study of this compilation will suffice to show that even the more flagrant errors of the ancients were still systematically taught; and therefore we are bound to conclude that the Hippocratic aphorism of turning by the head in breech presentation had, up to this period, been all but universally adopted in European practice, even although that error had been to a great extent corrected by the later Greek and the Arabian writers. It is not, then, too much to assert, as we have done, that the blunder of Hippocrates, so frequently alluded to, was the rule of practice for little less than 2,000 years after his death.

In this collection, however, there is one work which we must mention with more respect—that of the illustrious Ambroise Paré—of whom Smellie says no more than is his due when he terms him "the famous restorer and improver of midwifery." The revival of anatomical study under Vesalius, and the numerous dissections which had been made of pregnant women by him and by his follower Columbus, had already corrected many of the anatomical and physiological errors, which, being time-honored, were therefore considered to be respectable, and were generally admitted to be true. The belief in these doctrines being thus sapped by the logic of facts, the whole rotten superstructure began to crumble away, and from this epoch modern midwifery may be said to have had its origin. It required a mind of no ordinary power and energy to be the pioneer in this new path; but it requires no critical analysis of the work of Paré to show that the great surgeon was a great master, and that scientific Midwifery as well as Surgery had at last found a fitting modern exponent. Paré advises turning by the feet in difficult cranial presentations; but if this cannot be done, he recommends craniotomy, or delivering by the crotchet—which instrument he directs us to fix, by the method of Ætius, in the orbit or mouth, or below the chin. He frankly confesses, that although he has carefully studied the position of the fœtus in utero, he has been unable to come to a satisfactory conclusion as to what is to be considered the normal position; while, as regards the causes of difficult labor, he dilates at some length, and on the whole with considerable accuracy. After pointing out with great clearness the serious nature of the impediment caused by cicatrices, the result of former midwifery accidents, he enumerates the various positions of the fœtus which interfere with or prevent delivery, and concludes by noting the bad effects of uterine inertia, and of premature escape of the waters.

* See the chapter, "De regimine ejus, cujus partus fit difficilis causâ magnitudinis fœtûs."

† Albucasis or Alsaharavius.

‡ London, 1565.

§ Basel, 1586.

At this period, the Parisian school was undoubtedly the first in the world; and as all the leading surgeons there practised midwifery, the practice as well as the theory of obstetrics became rapidly developed. Guillemeau, surgeon to the French king, and a pupil of Ambroise Paré, further developed the theories of his master; but the book which seems to have exercised the greatest influence was the remarkable one of Mauriceau, "Sur les Maladies des Femmes grosses, et de ceux qui sont accouchées." This author gives by far the best account which, up to his day, had appeared of the phenomena of labor as observed by the accoucheur. He criticises with some asperity the views of Columbus, which, however, we find to be, at least as regards the position of the child in the womb, infinitely more correct than his own. The following are his conclusions on this point: Up to the seventh or eighth month, the child is situated in the centre of the womb, the head being towards the fundus and the face looking directly forwards. About this period an important change takes place in its position, which, if it happens sooner, is attended with danger. The weight of the head and upper part of the infant having now become relatively greater, it causes the child to turn forwards (*faire la culbute en devant*), so that the face is now turned directly backwards to the promontory of the sacrum. This doctrine is simply an amplification of the views of Hippocrates on this point; and it must be admitted, even in the present day, that the greater relative frequency of breech and irregular presentations in cases of premature delivery, lends some apparent confirmation to the idea. He repudiates the view formerly entertained, that the child, by its own instinctive or automatic movements, aided in any way in effecting its expulsion, and recognized not only the contractility of the uterine tissue, but also the supplementary expulsive force which is derived from the muscles of the abdominal walls, these acting, as he shows, with greater effect upon the rounded back and nates of the child than they could upon the head, did the head present. Mauriceau seems also to have some indistinct and inaccurate idea of the rotation which occurs in the pelvis; for, after stating that, in footling cases, it is necessary that the face in its descent should look backwards, he gives directions for turning the child during its descent, *unless this has already taken place*, so as to make the heels look directly forward.

Any one who may wish to pursue this subject further will find ample and most interesting material in the works of Peu, Dionis, Deventer, La Motte, Puzos, Roederer, Levet, and others. In many of these new errors are developed, such, for example, as the undue importance given to uterine obliquities by Deventer and his followers, who supposed them to be a frequent cause of tardy labor. The re-discovery of the midwifery forceps by the Chamberlens, about the middle of the seventeenth century, marks another and most important epoch; but this will fall to be more particularly considered when we come to discuss the forceps and its uses."

The interesting subject of the mechanism of parturition was inaugurated little more than a hundred years ago by Sir Fielding Ould, of Dublin, and this, too, is another important era in the history of midwifery. To trace the successive steps, from the faint glimmering of the truth which perplexed the shrewdness of Ould, and baffled the astuteness of Smellie, to the full development of the modern theory as it was laid before the scientific world in the celebrated essay of Naegele, would lead us upon ground which for the present we must avoid. In the sequel, and at the proper place, such of the historical facts as are essential to the comprehension of this subject will be briefly noted.*

It seems, on first sight, a paradox that the practice of midwifery should involve, in the human species, the supervision of a function which is purely physiological, and should be claimed by its professors as an important branch of the healing art. So difficult, indeed, has this problem been of solution that many, from Rodericus á Castro downwards, have asserted that the practice of the art was derogatory to professional dignity, and an unnecessary interference with a natural process. "Obstetriciam artem nec exercui nec exercere volo," wrote one of these; and there is reason to believe that the words find an echo even now. We need scarcely pause to refute the former of the two objections. We presume we may hold it as proved that, from the very earliest times, women required and obtained assistance at the period of delivery. This assistance was afforded, as we have already seen, by persons of their own sex; and that there is a fitness in this no one will gainsay. If we may judge, however, from the Athenian laws, we may assume that the practice of obstetrics did not prosper in the hands of women; but it must be confessed that there is evidence enough in the works of Arsinoe and Cleopatra to prove that some of them, at least, were quite familiar with the doctrines and practice of their age. And it must be conceded, further, in these days when women are knocking so loudly, and with such importunity, at the portals of professional recognition, that if the mantle of Mesdames La Chapelle and Boivin could be made to fall on the shoulders of their sisters of the present generation, female delicacy would be saved many a rude shock, and the cause of science would in no sense suffer. But what do they say who repudiate the general practice of the art? Women, they assert, should in their hour of need be attended by women, and only in the case of difficulty or danger should the male accoucheur be summoned. The answer to this simply is, that the assistance of the latter would, under such circumstances, be of no value whatever, as without a knowledge of the healthy or normal standard, which can only be attained by the constant observation of the natural process, ignorance, not skill, would be called upon to act. To the full as rational would it be to ask one to compute distance or space who had no knowledge of the standards of lineal measurement or capacity. Certainly, in the present day, Men are required for the practice of midwifery, skilled in medicine and the applied sciences, and who do not think of their dignity, any more than of their ease and comfort, when their services are in this matter required.

In regard to the other objection, we must, of course, admit that parturition is a physiological function. But, in the discharge of this function, there exist in the human species peculiar conditions which exercise, as compared with the lower animals, a special influence upon the progress and issue of labor. What these conditions are will be best understood by a reference to one or two points in comparative anatomy, which reveal certain analogies, the appreciation of which clears away many difficulties, and a knowledge of which is, in point of fact, almost essential to the student of midwifery.

[One of the first to teach midwifery in this country was Dr. William Shippen, a pupil of Dr. Wm. Hunter.

Dr. Shippen began to lecture on Anatomy, Surgery and Obstetrics in the Philadelphia College in 1765.

Dr. John B. Tennant gave his first course of lectures on this subject at King's College, New York, in the winter of 1769–'70, and Dr. Walter Channing was appointed Professor of Obstetrics in the medical department of Harvard College in 1815.

In the early part of this century medical colleges multiplied very rapidly. The medical department of the University of Maryland dates from 1807; that of Dartmouth, N. H., from 1810; the College of Physicians and Surgeons of Western New York from 1812; the medical department of Yale from 1813; the Vermont Academy of Burlington from 1818; the Transylvania University of Lexington, Ky., from 1819; the Berkshire Medical School of Pittsfield, Mass., from 1822; the Medical College of South Carolina, from 1824.

The student of the present time can form but a slight idea of the difficulties met with by the student of that time. There were no works on midwifery published in the United States prior to 1807, when Heath's translation of Beaudoloque was given to the profession. In 1810 the work of Dr. Burns, of Glasgow, was republished in Philadelphia, and in 1821 that of Dr. Denman.

While there were several manuals of more or less importance published by American authors, to Dr. Dewees belongs the credit

* For a critical analysis of this subject, see an essay by the author "On the Mechanism of Parturition." London, 1864.

of giving to the profession the first comprehensive work on obstetrics by an American, and, taking into consideration the time in which he wrote, the work was a very remarkable one. The next American text-book on obstetrics was by Dr. Charles D. Meigs, published in 1838. With this excellent work, and the literature of the subject since that time, all physicians are familiar.—G.]

At an early period of mammalian development, two rods or bars of cartilage may be observed passing, more or less obliquely, from the dorsal towards the ventral surface of the embryo near its caudal extremity.* The two parts are separated at their dorsal extremity, where they embrace the vertebral column; while in front, in most cases, they meet and form a *symphysis*. This is the primitive pelvis. As the process of development goes on, the cartilage of each side, widening to a great extent superiorly, ossifies from three centres, by the union of which the *os innominatum* is formed, the two lower segments—*ischium* and *pubis*—leaving a gap between them, the *obturator* or *thyroid* foramen. If we except the Cetacea and Sirenia, in which the pelvis is almost rudimentary, these characteristics are common to the whole mammalia. The innominate bones are firmly united above to the sacral vertebræ, and usually below to each other at the *symphysis;* and this union, firm as it is, is greatly strengthened by a double ligamentous union of considerable strength between the sacral and caudal vertebræ on the one hand, and the ischia on the other. This is familiar to anatomists as the greater and lesser sacro-sciatic ligaments, which are sometimes replaced by bone—as in the sloth.

The mammalian pelvis, then, by the union of the two innominate bones and the sacrum, forms, with some exceptions, a complete circle or girdle of bone; or, in other words, a short canal or tube which has two outlets. Of these, the anterior is called the *inlet* or *brim*, which is marked more or less distinctly by a line which runs from the top of the symphysis pubis to the first sacral vertebra. The axis of this is—owing chiefly to the obliquity of the innominate bones—never parallel to the vertebral column, but diverges from it more or less widely, according to what is termed the "inclination" of the brim. The *outlet* looks backwards or downwards according to the position of the animal, and is bounded in the dorso-ventral diameter by the caudal vertebræ on the one side, and the lower margin of the pubic symphysis on the other, and laterally by the great sacro-sciatic ligaments (or bones) and the converging borders of the ischia. As the planes of brim and outlet are never quite parallel, the axis of the pelvis is consequently more or less of a curve.

A careful study of the form, and extent of development, in the various mammalian groups, shows clearly that, as in other parts of the skeleton, the ever-watchful provision by nature of means to an end is here strikingly exemplified. In the Cetacea, where there are no pelvic limbs, the pelvis is composed of two slender bones ununited inferiorly, the chief use of which seems to be to afford an attachment for the crura of the penis and clitoris. In the Armadillo, it is strong and powerful, to aid in the support of the exo-skeleton. In the Carnivora, the ilium and ischium are in a straight line and of nearly equal length, the pelvis being thus elongated and narrow. The symphysis is long, includes part of both pubis and ischium, and, in adult animals of this class, is usually closed by anchylosis. In the Seals, the pelvis is small and of a different form from the terrestrial Carnivora, the ilia being small, and the ischial and pubic bones long and slender. The symphysis is small and loose, admitting of being widely separated during parturition.

In many of the Insectivora, the symphysis is absent, the bones being widely separated in the middle line. The pelvis of the mole, for example, is long and narrow, and its axis is nearly parallel with the vertebral column. The ischium, as well as the ilium, is united to the sacrum by anchylosis, and the brim is so narrow that, there being no union at the symphysis, the pelvic viscera lie external to the cavity, and parturition takes place beneath rather than through the pelvic canal. In the Rodentia the ischial and pubic bones are always largely developed, flat, and diverging posteriorly, while the symphysis is long and usually osseous. The guinea-pig is an exception, as here the union remains ligamentous, and admits of free opening during labor.

In the order Ungulata, the Pecora or true ruminants are characterized chiefly by the great development of the ischial tuberosities, forming a well-marked conical process which is diverted outwards on each side. The symphysis is long, and includes a considerable portion of the ischia, and large epiphyses are observed, forming the articulating surfaces. These parts ultimately become fused by anchylosis. In the Perissodactyla, the greater expansion of the ilia, as seen in a marked degree in the skeleton of the elephant, indicates, at first sight, an approach to the human type; but the narrowing of the pelvis at the level of the acetabula, and the comparatively small ischial and pubic portions, at once dispel the illusion.

The Edentata have the pelvis more or less elongated, and the ischia largely developed. In almost all, the ischia are directly connected with the vertebral column by one or more osseous bridges, the single one in the sloth passing from the ischial spine, and thus representing the lesser sacro-sciatic ligament. This is carried to the greatest extent in the Armadillos, where a long unyielding tube is formed by the coalescence of the ilium and ischium on the one hand, and a considerable number of sacral and pseudo-sacral vertebræ on the other. In most of the Edentates, not only the sacro-iliac articulations, but also the symphysis pubis, are anchylosed.

The Marsupiata and Monotremata are characterized by the great development of the ischial and pubic bones, and the development in the tendon of the external oblique muscle of the "marsupial" bones.

The facts here cited will suffice to show that the pelvis, in the various groups into which the mammalia have been divided, is formed so as to suit the requirements of the individual. The mode of locomotion, be it leaping, running, or swimming, is revealed to the anatomist by an examination of the pelvic bones, and in every case it will be seen that the preponderance of ilium, ischium, or pubis, is due to the necessity which exists for certain mechanical arrangements, by which alone can the required muscular power be effectively applied to the bony levers. The pelvis is also an efficient support to the organs which are usually contained within it, and especially to those which are connected with the function of generation.

Fig. 1. Fig. 2.

Fig. 1.—Pelvis of the Female Guinea-Pig.
Fig. 2.—The same; showing the separation of the bones during parturition.

The obstetrician, however, looks at the pelvis from a different point of view. In it he sees the osseous canal through which the product of conception must pass in the act of parturition. He sees in it also the protecting framework which shields the generative viscera from the effects of shock or injury. And, above all, he studies it as a structure which, if abnormal, may seriously obstruct the process of parturition. Let us look, then, for a moment, before quitting the subject, and from this standpoint, at the pelvis of the mammalia. Throughout the whole series, irrefragable evidence is afforded that the pelvis is designed with a direct reference to the propagation of the species; and we find, moreover, that, on the approach of labor, certain modifications of structure which then occur clearly prove that nature prepares the parts beforehand for the new function. Thus, in the Chevrotains, a group of little deer-like animals, formerly associated with the musk-deer, the ischia in the males join the elongated sacrum by

* See Flower's "Osteology of the Mammalia." London, 1870.

ossification of the sacro-sciatic ligaments, but in the females the latter retain their normal structure. In the prolific guinea-pig, again,* the pelvis is long and laterally compressed, the passage being much narrower than the diameter of the head of the mature fœtus. About three weeks before parturition, the inter-pubic ligaments become soft and extensile, so that during labor the innominate bones separate from each other at the symphysis, the sacro-iliac joint thus becoming on each side a hinge. After this process, the symphysis quickly returns to its former state, and in a few days presents only a little thickness and mobility. The young of the guinea-pig are far advanced at birth; some of the deciduous teeth are shed *in utero*, and they run about and begin to eat soon after they see the light.

In the cow, as the period of parturition approaches, a relaxation of the pelvic ligaments also occurs, but the process here is different.† The gradual upward curve and posterior projection of the ischia causes the well-marked dorsal projection of their tuberosities, which appear prominently on the rump, projecting on each side and above the coccygeal vertebræ. By this elevation of the ischia, the sacro-sciatic ligaments become a means of support to the pelvis, so that their action is inverted as compared with the corresponding structure in the human pelvis. As the period of utero-gestation approaches its termination, these ligaments, as well as those of the sacro-iliac joints, become relaxed to such an extent that the sacrum is observed to sink downwards between the innominate bones, so that the ischial tuberosities become very prominent, and relatively elevated. The object of this is manifestly to render parturition easier. Did this, indeed, not occur, there can be little doubt that in the cow the difficulties of labor which occasionally arise would be of much more frequent occurrence. It is interesting to observe, as the probable cause of dystochia in those animals, that, owing to the greater curve of the sacrum, the axis of the pelvis is necessarily more strongly curved than usual, and in this respect approximates to the human type.

If we now turn to the Primates, we shall be able to show, by a comparison of the human race with those of the mammalia which stand nearest to it in the scale, that the process of childbirth must be more difficult and more obnoxious to serious hindrance than in any—even the highest—of the other mammalia. In all the Simiadæ, the ilium is, as compared with man, much elongated. "Each os innominatum in the adult male gorilla," says Owen, "is one foot three inches in length, that of man being seven inches and a half; the breadth of the ilium is eight inches and a half, that of man being six inches." In the lower forms—as the baboons and monkeys—the ilium is even longer, relatively to the other bones of the pelvis, than is here described. The ilia are nearly in a straight line with the vertebral column, and the inferior rami of the ischia are directed almost horizontally inwards, entering into the formation of the pubic symphysis, which, in the ape tribe generally, may be more properly called the *ischio-pubic* symphysis. The form of the cranium is the familiar and ready test, not only in distinguishing between man and the lower animals, but also between the various races of mankind. It is peculiarly interesting to us, however, to observe that a careful examination of the pelvis will also supply equally reliable information. The chief peculiarities of structure which are exhibited in the case of the highest of the Simiadæ have just been noticed. In addition, we observe that the *depth* both of the true and false pelvis is much greater than in the human race, that the sacrum is much narrower, especially in the chimpanzee, that the ischial spines are more closely approximated, and, above all, the antero-posterior measurements at the brim prevail greatly over the transverse.

Were we to compare the highest ape with the lowest man, we would find the following broad points of distinction. In the ape, a pelvis with the brim much more inclined, its antero-posterior exceeding its transverse measurement; a bending of the pelvic brim at the ilio-pectineal eminence forming an angle of about 120°, called the *ilio-pubic angle*—a characteristic which, without exception, distinguishes the lower animals possessing pelves; a marked elongation of the ilia; and a parallelism of the symphysis with the vertebral axis. In man, less inclination of the brim, and a marked preponderance of the transverse over the antero-posterior diameter; the boundaries of the brim, here alone in the animal kingdom, *on one plane;* great expansion of the ilia, as compared with their length; and the symphysis forming an angle with the vertebral column. The import of this great gap in development is evident, and has its explanation in the adaptation of man alone of all created beings *to the fully erect posture.*

The descriptive anatomy of the human pelvis will form the subject of another chapter. We shall here glance only at its special functions, in so far as they may be held to differ from those of the lower animals. In all the other mammals the habitual and only natural position or posture of the animal is prone,—the dorsal surface being superior, the ventral inferior. In those in which pelvic limbs exist, the weight of the posterior or pelvic portion of the trunk alone is transmitted through the pelvis to the cotyloid cavities, and thence transferred to the heads of the thigh bones. In man, the whole weight of the body above the pelvis is directly transmitted to it by the imposition of the last lumbar vertebra on the base of the sacrum, from which again it is transferred when the body is erect to the femora, and in the sitting position to the tuberosities of the ischia. To enter upon an analysis of the mechanical laws upon which this depends would be suitable to a work on animal physics, but we must here confine ourselves to such points only as are germane to our subject.

The sacrum—which is relatively much broader and stronger in man than in any of the lower animals—is the part which receives the weight of the trunk, the centre of gravity being, according to Weber, 8.7 millimeters above the sacro-lumbar joint, or just above the pelvic arch. It has been compared by Cruveilhier to a wedge, by others to the key-stone of an arch, and by Sir Charles Bell to the heel of a mast,—the base of the vertebral column being fixed so that the interval between the innominate bones may be looked upon as the *step* in which the vertebral mast is socketed and mortised. In any case we may consider the weight as being transmitted from the sacro-iliac joints in one of two directions: in the erect posture, it passes through the irregular, thick, and curved buttresses which are formed by this portion of the ilia directly to the cotyloid cavities; in the sitting posture it passes, on a posterior plane, from the same joints almost directly downwards to the tuberosities of the ischia. The sacrum is thus described as forming the common culminating point of two arches—viz., the *cotylo-sacral* or *standing arch*, and the *ischio-sacral* or *sitting arch*. The extremities of these arches are prevented from starting outwards, not by abutments as in the ordinary architectural arch, but by connecting links or *ties*, which are represented in the cotylo-sacral arch by the horizontal pubic rami, and in the ischio-sacral by the united ischio-pubic rami. This complicated arch acts also by preventing inward pressure, in the erect posture, by the head of the femur; while shock is in a great measure obviated by the oblique manner in which the sacrum is placed—the sacro-sciatic ligaments preventing the movement of the coccyx upwards and backwards, while the ilio-lumbar ligaments prevent the corresponding motion of the base of the sacrum downwards and forwards.* The expanded external surfaces of the ilia give attachment to the mass of the glutei muscles, more powerful, for obvious reasons, in man than in any other animal.

But the pelvis has, in addition to the elaborate mechanical functions above shortly alluded to, a new and special function thrown upon it in man. This is the support of the pelvic viscera, including

* Owen—"Comparative Anatomy and Physiology of the Vertebrates."

† Todd's "Cyclopædia of Anatomy and Physiology." Supplement. 1859. Art. "Pelvis."

* Dr. Matthews Duncan, in his "Researches on Obstetrics," 1868 (p. 55), shows more correctly, that the weight is transferred from the sacrum to the cotyloid cavity, not directly, but indirectly through the agency of the posterior ilio-sacral ligaments.

the organs of generation. These latter being larger and heavier in the female, and in view also, no doubt, of the requirements of the pregnant state, nature here makes special provision for their accommodation, in the greater capacity and modified form to which we shall afterwards advert. In the lower animals, the abdominal viscera, and, to some extent, also the pelvic viscera, are supported by the lower abdominal wall. The contents of the pregnant uterus, therefore, gravitate downwards in the direction of the arrow in fig. 3, and, under no circumstances, does the weight of the uterine contents press into the cavity of the pelvis. Even in the Simiadæ, where the erect posture is to some extent assumed, the greater inclination of the pelvic brim prevents the gravitation of the uterus and its contents into the true pelvis. In a pregnant woman, on the other hand, not only are the pelvic viscera proper supported by the structures which form the floor of the pelvis, but some support is indirectly afforded to the abdominal viscera under certain circumstances. In the pregnant state, the uterus and its contents gravitate to a considerable extent downwards and backwards in the axis of the brim.

Fig. 3.

Diagram showing the direction in which the uterine contents gravitate in the Mammalia generally.

The necessity which thus exists for efficient pelvic support to these parts has not been overlooked. Were the pelvis a simple tube, with the inlet looking upwards, and the outlet downwards, it is obvious that no efficient support could be afforded. But the tube, far from being straight, is in a woman strongly curved—so strongly, indeed, that a line drawn so as to represent the axis of the brim and the long axis of the uterus (which we may here assume to be identical) will not fall within the plane of the outlet at all, but behind it, somewhere about the centre of the coccyx. By this curve in the pelvic axis, the lower part of the sacrum, the coccyx, the sacro-sciatic ligaments, the *levatores ani* and *coccygei* muscles, and the fascial and soft structures form a firm *floor*, by which, in a normal and healthy condition of the parts, perfect support is given to the structures of which we have spoken. But this manifest advantage is obtained at the price of increased difficulty in the act of parturition. This difficulty is, no doubt to a very great extent, compensated for by the development of the sub-pubic arch, a peculiarity of the human species which is but imperfectly developed in the lower animals. Without this, indeed, and that shortness of the symphysis in woman which admits of the widest development of the arch, labor would be always difficult and often impossible.

The function of the pelvis being thus in every case a complicated one, is so in the human female in an especial degree. The unyielding nature of the structure, essential to the effectual support of the trunk, and the curving of its cavity for the reasons above stated, render child-bearing in this instance exceptionally liable to dangers of various kinds, and thence arises the necessity for that thorough professional training which can alone engender confidence and develop skill.

The comparative facility with which parturition is effected in the lower races of the human species has also been used as an argument against the practice of midwifery. In reference to this objection, on which we need not dwell, there can be little doubt that the effect, in certain classes of society, of modern and luxurious habits, exercises no inconsiderable influence upon the physiological phenomena of parturition. As regards the difference between the races, many very interesting facts have been revealed by the researches of Vrolik, Weber, and others, but there is still in this direction a wide field for original investigation. The facts which already have been disclosed point to the important conclusion that there subsists in the various races a remarkable coincidence between the prevailing form of the skull and the diameters of the pelvic brim, and that, consequently, the adaptation of the fœtal skull to the pelvic passage during labor must be greatly facilitated. Weber's conclusions, drawn from the examination and measurement of a considerable number of crania, are, that we may admit, as the general rule, subject however to numerous exceptions, that the oval shape is most common in Europeans, the round shape in the American aborigines, the square shape in the Asiatic or Mongolian type, and the oblong in the Negro races. As regards the assumed facility of labor in the latter, there is every reason to believe that this has been greatly exaggerated, and that cases of dystochia, though comparatively rare, are yet not unfrequent. If the pelvis were the same in size and proportion in them as in Europeans, the inferior cranial development would afford an obvious explanation of the alleged fact of habitually easy labors. So far, however, from this being the case, we have just seen that the form of the pelvis corresponds to the shape of the head. An examination of Negro, Bushman, and other pelves shows in many instances a remarkable degradation of type, such as a vertical direction of the ilia, and their elevation at the posterior-superior spines, narrowness of the sacrum, and acuteness of the sub-pubic angle. An occasional peculiarity in some of the lower races, and one which appears even more to approach to the ape type, is the preponderance of the conjugate over the transverse diameter of the brim. But they who have asserted that the lower races referred to simulate in this respect Apes rather than Europeans have gone too far, as is clearly proved by the measurements given in Wood's admirable article on the pelvis in Todd's Cyclopædia, already quoted. From this it appears that while the transverse diameter may, in the higher Simiadæ, measure less than the conjugate by one and a half to two inches, the difference in cases of oblong pelvis in Negroes is merely fractional, and that the type is in every case far more closely allied to the European than to the Simian, where the conformation of the pelvis is such, even in the highest forms, that its marked peculiarities are appreciated at a glance.

Whether the pelvic articulations in women are, or are not, divaricable during parturition, is a question obviously of great practical importance to the accoucheur. Involving, indeed, as it does, practical considerations, this is a subject the study of which might here be considered premature. But, in view of the facts which have just been stated in relation to the comparative anatomy of the pelvis, this vexed question may, we believe, be noticed with more advantage at this stage than at any other. In so far as a study of the physiological phenomena of labor in the lower animals can throw light upon the subject, we have already seen that separation may take place to a very considerable extent at the symphysis, as in the guinea-pig (see fig. 2), or at the sacro-iliac joint, as in the cow. So far, then, analogy points to the possibility of such a separation. Besides, anchylosis of either one joint or the other, common as it is in the lower animals, is known to be, in the human species, an extremely rare occurrence.

Actual observation, again, by men of such undoubted authority as Paré, Levret, Smellie, and many others, has proved, beyond all possibility of doubt, that in women who have died during the parturient period, separation of the bones, in some cases at the symphysis and in others at the sacro-iliac joints, has been seen and recorded. Few practitioners of extended experience have failed to observe that women occasionally complain, it may be either before or after labor, of pain in the neighborhood of these joints, difficulty or inconvenience in walking, and, more rarely, a grating or crepitant feeling, arising obviously from an unwonted motion of the articulating surfaces upon each other; from which we may conclude that separation may, to some extent at least, occur. Cases such as have been detailed by Soemmering—where the bones at the sacro-iliac joint have been found separated to the extent of an inch—have been supposed to be the result of disease and deposit of pus.

Admitting, then, that some separation does occasionally occur, are we to assume that this is to be held as abnormal and morbid, or admitted as one of the essential physiological phenomena of human parturition? It is, we suppose, now universally believed

that, during the last months of pregnancy, the cartilaginous and other structures forming these joints, to be hereafter described, become softened, as if by serous infiltration. The synovial membranes, indistinct before, now become capable of demonstration; and, more important, perhaps, than all, the tissues become thickened, while the ligaments of the joints are relaxed. The effect of such thickening must, of necessity, be, like ivy roots in a wall, to force the bones asunder and, consequently, to increase the pelvic diameters. If, however, there is, as has been asserted, a yielding much more extensive than this, such motion may be assumed to occur in one of two ways: either by a separation at the pubes, involving a hinge motion of the sacro-iliac joint, as in guinea-pigs, or by a movement of the sacrum between the ossa innominata, involving a hinge motion of the symphysis, as in the cow. As regards the first of these, a careful examination of the circumstances under which it may occur would seem to indicate that a separation of the pubic bones to the extent even of an inch would add very little to the diameters of the brim, and would contribute least of all to the smallest or conjugate diameter. The analogy which the frequent yielding of the symphysis seems to reveal gave rise, about the end of the last century, to an operation consisting in the artificial section of the symphysis in cases of obstruction at the brim—a mode of procedure which Dr. Matthews Duncan seems to think has been in these days too completely consigned to oblivion.

The other method in which the pelvic capacity may be increased by a movement of these joints is by the motion of the sacrum between the ossa innominata, somewhat as it has been shown to occur in the cow.* From what has already been said, it may be inferred that to compare the sacrum either to a wedge or a keystone is very far from accurate. We have seen that this bone, besides its union with the sacrum by means of intervening cartilage, is maintained in its position by the ilio-lumbar and sacro-sciatic ligaments—the former preventing, or rather strictly limiting, along with other forces, the downward and forward movement of the promontory; while the latter limits, in like manner, the upward and backward motion of the coccyx. Now, these ligaments share in the general relaxation of the pelvic structures towards the end of gestation; and thereby we may assume, that the movement or oscillation on its transverse axis, of which the sacrum is capable, and which is said by Zaglas to be about a line in the unimpregnated condition, is, in the last months of pregnancy, considerably increased. The manner in which this oscillation of the sacrum takes place in different positions of the woman is clearly shown by Zaglas. "In the erect position, the promontory of the sacrum is not in the position of greatest projection into the brim of the pelvis, but the reverse; and, consequently, the apex is in its forward position, diminishing the outlet and relaxing the sacro-sciatic ligaments. When the body is bent forward, on the other hand, the base of the sacrum is protruded into the brim, the apex is tilted upwards, the sacrosciatic ligaments put on the stretch, and the outlet of the pelvis consequently enlarged. These movements take place, ordinarily, both in man and woman, in defecation, etc., but in her they are of greatest interest and importance in the function of parturition."† The backward motion of the coccyx has also the effect of producing lateral widening of the pelvis, by bringing a wider part of the base of the sacrum between the ilia. This, of course, supposes some gliding motion in the sacro-iliac articulation, or, at least, yielding of the parts. The experiments of MM. Giraud and Ansiaux seem to show that, in contracted pelves, the movements take place to an even greater extent, as if nature were doing her utmost to obviate the disastrous effects of pelvic deformity. Dr. Matthews Duncan, in his admirable essay on this subject, points out, with great clearness, the very remarkable manner in which these alterations correspond with the phenomena of the progress of the child in parturition. In the first stage of labor, for example, when the head is passing through the brim, the woman prefers the standing, sitting, or reclining posture, in which the brim of the pelvis is, as we have seen, kept open at the expense of the outlet (see fig. 4); but in the second stage she bends her body forwards, draws up her legs, and calls into action the abdominal muscles, which act by tilting up the symphysis; in a word, her posture and voluntary efforts are now precisely those which may most effectively increase the conjugate diameter of the outlet by tilting back the coccyx. To the motion of the sacro-coccygeal joint, which is universally admitted, we need not at present specially advert.

Fig. 4.

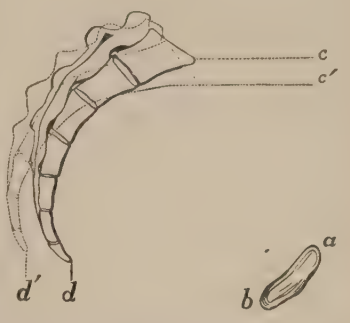


Diagram showing the oscillatory movement referred to. (Matthews Duncan.)

From these and other facts disclosed up to the present time, we conclude:

1st. That in the last months of pregnancy, a marked relaxation and softening of the pelvic articulations take place.

2d. That, as the result of this modification in structure, an increased, though limited, mobility is permitted, which tends to facilitate labor.

3d. That in addition to the movement of the sacrum on its transverse axis, as above noted (which may be considered as peculiar to the human species), the manner in which the joints yield is probably very similar to what obtains in the case of the cow. The sacrum acts in this case as a wedge separating the ossa innominata and causing the symphysis to open with a hinge motion, while, during the violent efforts of labor, the whole sacrum may probably be driven backwards to a trifling extent. Separation of the bones at the symphysis is occasionally observed, but this is probably the exception, while the other is the rule. The development of the synovial membranes seems, when taken along with the above facts, to warrant the conclusion arrived at by Lenoir, "that the articulations of the pelvis proper should not be considered as *amphiarthroses*, but as *arthroses*."

* Barlow. Monthly Journal of Medical Science, January, 1854.

† Matthews Duncan. Op. Cit., p. 142.

CHAPTER II.

THE PELVIS.—*MEADOWS.*

As the groundwork of all obstetric knowledge, it is indispensably necessary that the student should possess an intimate acquaintance with the anatomy and physiology of the organs of generation, and especially of the pelvis. Nothing so much facilitates the *study* of Midwifery, and no surer basis exists for success in the *practice* of it, as a clear and accurate idea of the size, form and relations of the pelvis and its contents; hence the appropriateness of commencing a work of this kind with a consideration of these parts.

This bony basin (as its name implies) is situate between the spinal column above, and the lower extremities below, which latter are attached to it by muscles and ligaments. In very early life, it is composed of fourteen or sixteen separate portions; but at the age when an acquaintance with its leading features claims the special attention of the obstetric practitioner, it consists only of four: two of these, the *sacrum* and the *coccyx*, form its posterior wall; and two, the *innominata*, form the anterior and lateral walls.

It is divided into two parts, the *True* and the *False Pelvis;* the latter is formed exclusively by the alæ of the ilia, which spread out laterally and posteriorly from the margin of the brim of the true pelvis, upwards, outwards, and backwards, to support the abdominal viscera, and to give attachment to muscles forming the abdominal wall; in front it is entirely deficient. It presents little of importance in a practical point of view to the obstetrician: it is separated from the true pelvis by a prominent ridge, called the *linea-ilio-pectinea.*

The *True Pelvis* is formed by the union of the sacrum and coccyx behind; by the pubes in front; and by the ischia on either side; the pubes, ischium, and ilium of each side uniting in adult life to form one large irregularly-shaped bone, the *os innominatum,*

Fig. 5.

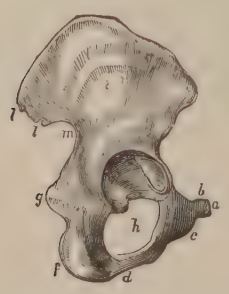
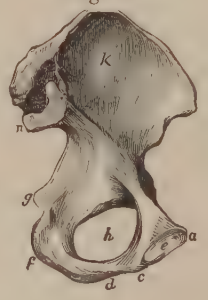


Fig. 6.



(figs. 5, 6). All these bones and their attachment to one another may now be separately considered preparatory to a study of the pelvis as a whole.

The *Pubis* (*a*, figs. 5, 6) is the smallest of the three bones: it is situated in front, and possesses a *body* or *base*, which enters into the composition of the acetabulum; a *horizontal portion*, or ramus (*b*, fig. 5), running forwards and inwards, which forms part of the pelvic brim, on which anteriorly is situated the *spine* of the pubis, which gives attachment to Poupart's ligament; and a *descending portion* (*c*, figs. 5, 6) or ramus, which is directed downwards, outwards, and backwards, and which, uniting with the ascending portion of the ischium (*d*, *d'*), forms with the same parts on the opposite side the *pubic arch.* The two pubes are united together in the middle line by a firm fibro-cartilage (*e*, fig. 6), constituting the *symphysis pubis.*

The *Ischium* (*f*, *f*, figs. 5, 6) is the next in size and the lowest in position; it consists of a *body* or *base*, which contributes largely to the acetabulum, uniting there with the two other bones—the pubis and ilium; a *spinous process* (*g*, *g*, figs. 5, 6) projecting backwards and inwards from below the body, or base, of the bone; a *tuberosity* (*f*, *f*), which is the most depending portion of the bone, and is that on which we sit; and an *ascending portion*, or ramus (*d*, *d*, figs. 5, 6), which rises obliquely upwards, forwards, and inwards, to unite, as before said, with the descending portion of the pubis to form one side of the pubic arch. If we examine the inner surface of this bone, we shall observe a line, or ridge, extending from the pectineal eminence to the spinous process, and dividing this aspect of the bone into two parts, or planes, the one inclining towards the obturator foramen and the sub-pubic arch, the other to the great ischiatic foramen; the relations and arrangement of the soft parts make the inclination of these planes still more distinct and definite. It is important to remember this in relation to the mechanism by which the head of the child is rotated in its passage through the pelvis.

Between the several rami of the pubis and ischium, assisted also by other portions of these two bones, is a large oval or triangular aperture, the *obturator foramen* (*h*, *h*), which, in the recent state, is covered in by a membranous ligament, and the chief object of which is to impart greater lightness to this part of the pelvis, while, at the same time, it allows of the attachment of muscles.

The *Ilium* is the largest and the highest in situation of the innominate bones; its outer surface, called the *dorsum* (*i*, fig. 5), is rough for the attachment of the gluteal muscles; its inner surface (*k*, fig. 6) lodges the iliacus internus; the *base*, or *body*, of the bone contributes to the acetabulum; and, springing from this, the broad *ala* projects upwards, outwards, and backwards to form the cavity of the false pelvis; behind and below the body of the bone and the posterior *spinous processes* (*l*, *l*, fig. 5) is a large notch, the *sciatic notch* (*m*), which in the recent state is divided into two parts by strong ligamentous bands. Posteriorly, the ilium presents a broad, irregular, ear-shaped surface (*n*, fig. 6), which is united to the sacrum, by a firm fibro-cartilaginous union, to form the *sacro-iliac synchondrosis.* Between the body of the bone and the ala is a prominent ridge, constituting a part of the brim of the true pelvis, the *linea-ilio-pectinea.*

The three bones just considered, it will be seen, do not all take equal parts in the formation of the true pelvis; for instance, the ilium forms part of the brim, but none of the outlet; the ischium part of the outlet, but none of the brim; while the pubis shares in both. In consequence of this arrangement, deformity of the pubis affects both brim and outlet; while in deformity of the other bones, either the brim or the outlet would alone be affected.

The *Sacrum* (figs. 7, 8) is a large pyramidal-shaped bone formed

of several vertebræ which have coalesced (*a*, *a*, fig. 7). The base of the pyramid (*c*, *c*, figs. 7, 8) is situated uppermost; it is broad and flat, and supports the vertebral column; at this junction it pro-

Fig. 7.

Fig. 8.

jects slightly forwards, and is capped by a firm, wedge-shaped intervertebral fibro-cartilage, which is much thicker in front than behind, projects a little in advance of the head of the sacrum, and is in truth, therefore, the point to which is given the name of the *promontory of the sacrum;* below this, the surface of the bone presents anteriorly a considerable concavity, which is called *the hollow of the sacrum;* it terminates below at the apex of the pyramid (*d*, fig. 7), where the bone articulates with the coccyx. On the anterior surface of the sacrum are seen four openings on either side (*e*, fig. 7), for the transmission of the sacral nerves. Laterally, this bone articulates by an almost immovable joint with the two iliac bones, the point of union being called the *sacro-iliac synchondrosis;* it is from this point posteriorly that the oblique diameters of the pelvis are measured. In the fœtus the sacrum consists of five, and occasionally of six pieces.

The *Coccyx* is the only distinctly movable portion of the bony pelvis; its cartilaginous connections with the sacrum, as well as with the three, four, or five portions into which it is divided, admit of a certain amount of movement—to the extent, perhaps, of about an inch, by which the outlet of the pelvis is increased in the antero-posterior direction. This bone, as a whole, is of pyramidal shape, with the apex lowest; it has some supposed resemblance to a cuckoo's beak, hence its name; the bones of which it is composed are imperfectly developed vertebræ. The coccyx is of considerable importance in labor, for if the joints which enter into its formation are anchylosed, or if its connection with the sacrum is of a like kind, a very serious obstruction arises to the passage of the head.

The various deformities to which the pelvis is liable are, as already hinted, very unequally shared by the bones which enter into its formation; sometimes one bone or only part of a bone may occasion the deformity; at other times, several bones are thus affected. The sacrum, for instance, may have its upper portion projecting too far forwards, thereby narrowing the conjugate diameter: this is the most common of all deformities. Or the same bone may be too straight on its anterior surface. Lower down, the os coccygis may be firmly united to the sacrum, or its separate portions may have ossified together, so as to form with the sacrum one inflexible curve; this difficulty is occasionally met with in women pregnant for the first time at an advanced age. Again, the pubes may have their arch narrowed by approximation of the descending rami; this retards considerably the exit of the head in the second stage of labor; or, again, the same bones at their symphysis may have receded so as to diminish the antero-posterior diameter. Lastly, the ischium may be at fault (and when it occurs it is often a very serious one), by the spinous process being too long, and projecting too far into the pelvic cavity; or, again, the tuberosities of the ischia may approximate too closely, so as to narrow the transverse diameter of the outlet.

Between the several bones which have now been considered, there are some very important *Articulations*, and there are also certain ligamentous structures which are deserving of attention from the practical obstetrician.

The *Symphysis Pubis* is the name given to the union between the two pubes in front. It consists of a thick layer of tough fibro-cartilage, firmly binding together the two apposed bones: before, behind, above, and below this are some very strong ligaments, which still further strengthen the joint, and limit, if they do not actually prevent anything like movement between the bones, even under the most violent uterine action. Probably the chief value of this joint is to enable the pelvis to resist sudden and violent shocks, which it does most effectually, and which would be felt severely if the pubic bones were ossified together. There is, however, some reason for believing that at every ordinary labor this joint separates to a certain though very limited extent; changes take place in the pelvic articulations during the latter months of pregnancy which seem to facilitate this movement, but the extent of mobility is very slight, and it probably adds little or nothing to the pelvic diameters.

The *Sacro-Iliac Synchondrosis* is formed by the rough and irregular lateral surfaces of the sacrum and ilium, which are united by a firm lamella of fibro-cartilaginous tissue; there is little or no movement allowed by it, and the joint is further strengthened by ligamentous bands passing between the two bones on their anterior and posterior surfaces. There are also two other ligaments of great strength, called respectively the *great* and *small sacro-sciatic ligaments*, which pass, the one (large) from the lower posterior spine of the ilium and from the sacrum and coccyx to the inner part of the tuber ischii: the other (small) passes from the side of the sacrum and coccyx to the spine of the ischium. The effect of these ligaments is to complete the ring of the pelvic outlet, and, at the same time, to narrow its postero-lateral dimensions.

The *Sacro-Coccygeal* joint is of simple hinge-like character, as are also the joints between the several portions of the coccyx, having anterior and posterior ligaments, with their fibro-cartilages interposed, and, in a few cases, a synovial membrane.

There is yet one other point which is of some importance to the obstetrician—viz., the *Lumbo-Sacral:* this is formed by a layer of firm, tough fibro-cartilage, placed between the last lumbar vertebra and the sacrum. It is thicker in front than behind—wedge-shaped, as it were—and in reality is more prominent anteriorly than the sacrum itself.

In regard to the amount of movement which is possible between the several pelvic articulations during labor, Dr. Laborie has arrived at some important conclusions. Although it is very generally admitted that the pelvic articulations acquire a certain degree of mobility during labor, the value of this mobility is much disputed. All anatomists agree in regarding the sacro-iliac synchondrosis and the symphysis pubis as arthrodial joints; but Dr. Laborie, on the contrary, from investigations which he has made on the pelves of recently-delivered females, believes that they present the characters—partly of enarthroses, the articulating surfaces being convex in one direction, concave in the other; partly of ginglymi, their movement being limited to one direction.

As regards the pelvic inlet, the influence exerted on parturition by the mobility of the pelvic articulations is undoubtedly very small; but when the child, having entered the true pelvis, fairly engages the outlet, then the mobility of the pelvic joints may play an important part, and the mechanism by which this outlet is enlarged is extremely simple. Inasmuch as the diameter of the outlet is in reality less than that of the inlet, some provision must be made in order that the child may perform the rather complex movement of evolution which takes place in the pelvis. Accordingly, the oblique and antero-posterior diameters are easily increased by the relaxation of the sacro-ischiatic ligaments, and the mobility of the sacro-coccygeal articulation; hence all the resistance is produced by the transverse diameter. Yet the pressure exercised by the forces which push the head towards the ischiatic tuberosities is sufficient to widen the space. The articulations are relaxed by means of a force which is the more powerful in proportion as its point of action is near the end of a long lever, represented by the entire distance between the ischia and the articulations. This lever is 128 millimeters in length, between the sacro-iliac synchondrosis and the tuberosity of the ischium; hence a separation of two millimeters at the lower part of the synchondrosis gives the end of the lever—

that is to say, the transverse diameter—an additional length of nearly two millimeters; and there is, he says, reason to believe that this increase may be even greater. In primiparæ above thirty years of age, the mobility of the pelvic articulations may be destroyed, or greatly limited; hence the difficulty in labor is concentrated in the outlet of the pelvis, however well formed the woman may be. Such are the main conclusions arrived at by M. Laborie, and they no doubt represent pretty fairly the facts of the case.

At all events, it may be conceded that some movement certainly takes place during labor between the several pelvic articulations. Dr. Leishman, in his admirable "System of Midwifery," argues strongly in favor of this view by reference to comparative anatomy, and he cites the case of the guinea-pig, where considerable movement is allowed between the symphysis pubis, and that of the cow, where the sacro-iliac joint yields very freely; in man, both probably give a little. Certain it is that patients often complain during the latter weeks of pregnancy, and still more after delivery, of a feeling of great relaxation and want of support about the pelvic joints; this is probably due rather to a kind of softening and relaxation of these ligamentous structures than to any actual movement between the bones themselves.

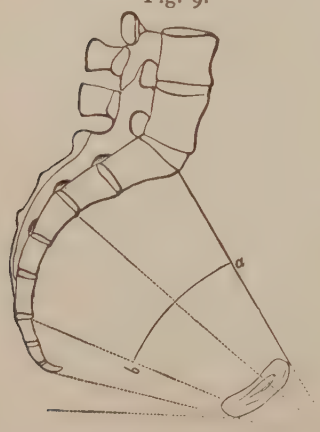
The *Pelvis as a whole.*—Thus constituted, the pelvis presents a firm bony basin, combining at the same time great strength with lightness. It is divided, as I have already said, into an upper and a lower portion—the *False* and the *True* Pelvis. The upper forms part of the abdominal cavity, being strong for the attachment of the muscles which form the abdominal wall, and helps to support the abdominal contents.

In the *True Pelvis*, regarded as a whole, we have especially to notice its *Brim* or *Inlet*, its *Cavity*, and its *Outlet*, their different dimensions, and the varying direction of their several planes, axes, or inclinations. A correct appreciation of all these is of the first importance in the study and practice of midwifery.

And first it should be noted that the dried pelvis scarcely represents the relations of the parts in the recent state: it may be well, therefore, briefly to call to mind the several structures occupying the pelvic cavity. In the first place, the obturator foramina are enclosed by firm, thin, fibrous membranes, perforated only for the passage of nerves and blood-vessels, and giving attachment to the obturator muscles; over these is the levator ani on each side, and thus a soft fleshy cushion is formed for the head to rest against in its passage through the pelvis. Posteriorly we have the pyriform muscle, part of the obturator, with the plexuses of nerves and blood-vessels, which pass through the two sacro-ischiatic foramina; and thus a similar fleshy cushion is formed for the head posteriorly.

In considering the various *measurements of the pelvis* at its different points of brim, cavity, and outlet, we may regard the pelvis as having certain *planes* at the several parts mentioned; and the measurements are usually taken at those planes in three different directions. Hence we have at the brim *the straight, antero-posterior, or conjugate diameter*, which is taken from the posterior aspect of the symphysis pubis to the most projecting point of the sacral promontory. Next we have *the transverse*, which is measured from the centre of the linea-ilio-pectinea of opposite sides; and lastly, we have *the two oblique diameters*, which are taken from the two pectineal eminences to the opposite sacro-iliac synchondrosis. These *oblique diameters* are called, respectively *right* and *left*, according to the sacro-iliac joints, the right oblique being measured from the right sacro-iliac joint, and the left oblique from the left joint.

Fig. 9.



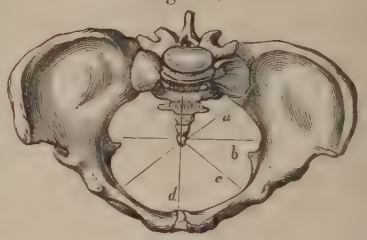
The *Planes of the Pelvis* (fig. 9) are represented by certain imaginary lines drawn from different parts of the pelvis. These imaginary lines may be drawn at any conceivable part of the pelvis; practically, however, we limit these planes to three—viz., *the plane of the brim, of the cavity*, and *of the outlet*, and it is at these points that the several pelvic diameters are measured. The annexed sectional figure represents these several planes, and it will be seen that by their extension beyond the pubis they would all meet at a point about two inches from that bone. The line *a, b*, represents the axis of the pelvis from brim to outlet, and it intersects all the planes of the pelvis at a right angle. The axis of the brim, of the cavity, and of the outlet are represented by lines drawn perpendicularly and at right angles to those several planes.

Thus measured, the *plane of the Brim* of the pelvis (*a, b, c, d*, fig. 10), which is irregularly oval, presents the following dimensions:—

Antero-posterior diameter	(*d*, fig. 10).	4¼	inches.
Transverse "	(*b*, fig. 10).	5¼	"
Oblique "	(*a, c*, fig. 10).	4¾	"

The *circumference* varies from 13 to 14½ inches.

Fig. 10.



In these and the following measurements, it must be understood that the figures given refer to the dry condition of the pelvis, and would probably be diminished in the recent state by fully a quarter of an inch in the conjugate, and half an inch in the lateral diameter.

The *plane of the Cavity* presents some slight modification; thus:—

Antero-posterior diameter	. . . .	4⅔	inches.
Transverse "	. . . .	4⅓	"
Oblique "	. . . .	5⅛	"

The first of these measurements is taken from the centre of the hollow of the sacrum (*n*, fig. 11) to the centre of the symphysis pubis (*f*); the second from the wall of the lower margin of the acetabulum on one side to that on the other; and the third from the obturator foramen (*h*) on the one side to the middle of the sacro-sciatic notch (*l*) on the other.

Fig. 11.

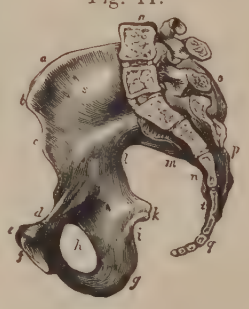
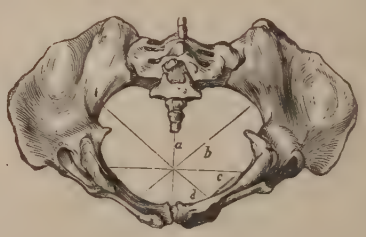


Fig. 12.



Furthermore, it must be noted that the perpendicular dimensions of the cavity are very peculiar, and should be borne in mind in reference to the progress made by the head in labor. Posteriorly, from the promontory of the sacrum to the tip of the coccyx, it measures from five and a half to six inches, while anteriorly, behind the symphysis pubis, there is a depth of but one and a half or two inches; laterally, from the tuber ischii to the brim, it is about three and one-half inches.

The *Outlet* (*a, b, c, d*, fig. 12) presents much greater difference than exists between the brim and the cavity, for here the longest and shortest diameters have changed places with the brim—the shortest diameter at the brim is the longest at the outlet; thus:—

Antero-posterior diameter (*a*, fig. 12).	4	inches
Transverse	" (*c*, fig. 12).	4¼	"
Oblique	" (*b*, *d*, fig. 12).	4⅔	"

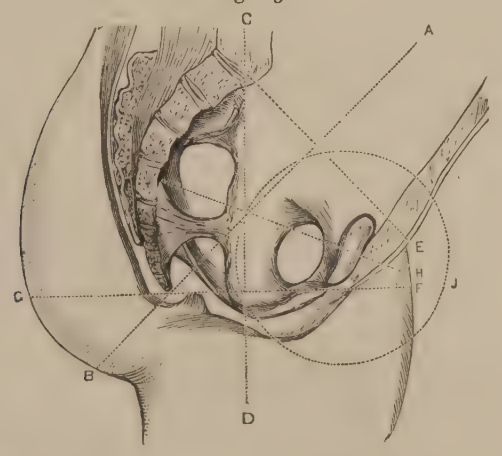
The antero-posterior, though here shown as only four inches, is capable of extension to another inch in consequence of the mobility of the coccyx. This measurement is taken from the coccyx to the lower border of the symphysis pubis; the transverse between the two tuber ischii; the oblique between the point of junction of the pubis with the ischium and the middle of the lower edge of the sacro-sciatic ligament.

It is worth while to bear in mind that, as a general rule, all the oblique diameters, except that of the brim, are, in the natural state during life, the longest, and those of the brim are called right or left according to the sacro-iliac synchondrosis from which they are measured.

Now, if we consider for a moment the shape and direction of the pelvis from brim to outlet, its several measurements and planes, we shall be able to understand how it is that the head of the child is, as it were, forced to take the direction which it usually does. For instance, suppose the head enters the pelvic brim in the transverse diameter, the occiput being directed to the left, and the sinciput to the right, as soon as it descends a little its two extremities are forced along the opposite planes of the ischium, the occiput taking usually the anterior plane of the left ischium, thus gliding towards the left foramen ovale, while the sinciput traverses the posterior plane of the other ischium towards the ischiatic foramen, or *vice versâ*, and thus a slight rotation is effected at this stage, which is still further increased when the occiput glides past the foramen ovale over the ischio-pubic ramus, and so under the pubic arch, while the sinciput passes gradually into the hollow of the sacrum over the lesser sacro-sciatic ligament. Thus the head comes to occupy in the cavity of the pelvis the antero-posterior or conjugate diameter.

Obliquity of the Pelvis.—The pelvis is so situated with regard to the rest of the trunk, that the *axis of the brim* (A, B, fig. 13) forms with the horizon (F, G) an angle of about fifty-five degrees; the upper border of the pubis is thus considerably below the level of

Fig. 13.

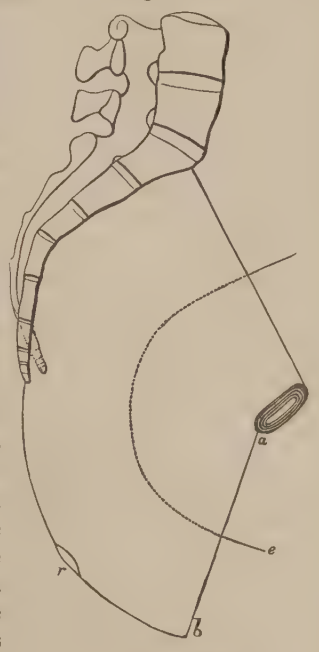


the promontory of the sacrum, nearly four inches according to Naegele. This is very well seen by reference to the dotted line (E) in the annexed figure, which indicates the plane of the pelvic brim. But in consequence of the difference already mentioned in the depth of the anterior and posterior walls of the cavity—the one one and a half to two inches, and oblique in direction, the other about five inches long, likewise oblique and much curved—the axis is differently situated in different parts, and generally follows the curve of the pelvis. At the *inlet* it is directed downwards and backwards, coinciding with a line (A, B) drawn from a point a little above the umbilicus to the end of the coccyx. While at the *outlet* it is directed downwards and a little forwards, and follows a line from the promontory of the sacrum to the space between the tuberosities of the ischia (C, D). The line (H) in fig. 13 indicates the plane of the cavity of the pelvis, and it is at this level that the dimensions of the pelvic cavity are taken.

It will thus be seen that the several axes of the pelvis vary a good deal in their direction, and they may be defined in all cases as lines drawn from the centre of, and at right angles to, their respective planes. Thus the axis of the pelvic brim is represented by a line drawn at a right angle from the centre of the plane of the pelvic brim. The axis of the cavity is represented by a line drawn at a right angle from the centre of the plane of the cavity; while the axis of the outlet is represented by a line drawn at a right angle from the centre of the plane of the outlet.

The circle (J) is called the circle or curve of Carus, and it was formerly supposed to indicate the complete axis of the entire pelvic canal, and to represent the course which the child took in its passage through the pelvis. Its centre is in the middle of the symphysis pubis, and its radius is the half of the pelvic diameter at this point. The same was said of the two other diameters—inlet and outlet—so that the circle was thought to intercept the centre of all the diameters of the pelvis, and in this way to correspond with the course followed by the fœtus in its passage through the pelvis. This, however, is now known to be an error, for the pelvic canal is not a simple cylinder, and no such circle or curve can represent its axes at different points from brim to outlet.

Fig. 14.



The true pelvic curve or *Axis of the Parturient Canal* is represented in the annexed diagram, fig. 14. Here the planes of the brim and outlet are extended to their point of intersection at *a*, from which point lines may be drawn through the pelvic cavity representing so many imaginary planes, and if now we "draw a line which shall pass through the geometrical centre of each of these planes, that line will be found to be a curve, which coincides very closely with the axis of the true pelvis, which is the segment of no circle, and which has been well described as an irregular parabola."—*Leishman.*

External Measurements.—The dimensions of the pelvis, derived from *external* measurements, are occasionally of some moment in the diagnosis of deformities; and though too much reliance should not be placed upon them, yet the following results, which are given from a large number of observations, possess some value:—

The external antero-posterior diameter of the pelvis is from 7 to 8 inches.

The external transverse, between the crista of the ilia of either side, 13 to 16 inches.

From the anterior superior spine of the ilium of one side to that of the other, 10 to 12 inches.

From the great trochanter of one side to the sacro-iliac synchondrosis of the other, 9 inches.

The depth of the pelvis, from the top of the sacrum to the coccyx, from 4 to 5 inches.

It is said that by deducting about three inches from the antero-posterior diameter, and four inches from the transverse, some approximation to the diameters of the pelvis internally can be made.

It remains now only to notice the chief *differences in the male and female pelvis.* In the female the bones are thinner, smoother, and more delicately formed; the alæ ilii are more widely spread, the brim is more capacious, the promontory of the sacrum less

projecting, the cavity shallower and broader, the sacrum more curved, the symphysis pubis shorter, the arch of the pubis wider and more rounded, the tuberosities ischii farther apart, the acetabula are also wider, thus throwing the thigh bones more apart, and the foramen ovale is triangular instead of being round. Speaking generally, we may say that the male pelvis is chiefly remarkable for its depth and narrowness, the female for its width and shallowness; a difference of considerable importance, inasmuch as it exposes less surface to the pressure of the child's head, resistance is consequently diminished, and this is favored by the generally increased capacity.

For an account of the various *abnormalities of the pelvis*, the reader is referred to the chapter which treats of the subject of Unnatural Labor from an Abnormal Condition of the Passages.

CHAPTER III.

FEMALE ORGANS OF GENERATION.—*LEISHMAN.*

The Organs of Generation in the female include—besides the Uterus, Ovaries, and other parts situated internally—the Vagina, Vulva, and Mons Veneris. These latter being, more properly, external organs, anatomists have divided the whole into *External* and *Internal* Organs.

External Organs of Generation.—Immediately over the symphysis pubis, above and in front of the opening of the *vulva* or *pudendum*, is a firm cushion-like eminence, about two inches in depth and three inches transversely. This, which is called the *Mons Veneris*, varies in prominence according to the conformation of the pubes, and the amount of adipose and cellular tissue in it and the contiguous parts. After puberty, it is covered with hair, and is abundantly furnished with sebaceous follicles, which were supposed by Moreau to contribute in some measure to the dilatation of the external parts at the moment of delivery. Continuous with this structure, extending downwards and backwards, and becoming gradually thinner in their course, are two rounded folds of integument, which, diverging from each other, leave in the median line an elliptical interval between them. These are the *labia majora*, *labia externa*, or *labia pudendi*. They present an external surface, covered with skin similar to that of the mons veneris, and an internal surface lined with mucous membrane, which is the commencement of the genito-urinary tract. Behind, the thinner margins unite, forming the posterior commissure of the vagina. The *fourchette*, or *frænulum pudendi*, is a transverse fold in front of this, which resembles and has been aptly compared to the continuation of the skin at the roots of the fingers, and is very generally torn in first labors. The depression between the fourchette and the commissure is named the *fossa navicularis*. Between the skin and superficial fascia of the labia there exists a purse-shaped sac, which has been described by M. Broca as analogous to the dartos tunic of the scrotum. This sac is filled with fat and cellular tissue, is the receptacle occasionally of hernia, and to it have been traced the terminal fibres of the round ligament of the uterus.

The *perineum* extends from the posterior commissure to the anus, and is usually about an inch and a half in length. It is made up of highly distensible cellular tissue, and has been said to contain some yellow elastic tissue. It is, undoubtedly, susceptible of great distension during labor, without, under ordinary circumstances, any risk of rupture.

On separating the labia majora, the *labia minora* or *nymphæ* are brought into view. These are two thick mucous folds, somewhat resembling the comb of a cock, about an inch and a half in length, having their origin on the inner surface of the labia majora, and becoming wider as they pass upwards and forwards, converging towards the clitoris, with the prepuce of which they are continuous. The *clitoris* is a small erectile tubercle, situated somewhat above the level of the lower margin of the symphysis pubis. Like the penis of the male, it has a suspensory ligament, two crura, two corpora cavernosa, and a glans, but has no corpus spongiosum nor urethra. Two muscles, corresponding to the ischio-cavernosus, are in the female called "erectores clitoridis." The *vestibule* is a small triangular space, bounded above by the clitoris, below by the urethra, and on either side by the diverging nymphæ. It is about an inch in length, is smooth on the surface, and is specially important as a guide to the finger of the accoucheur in the introduction of the catheter—an operation which should always be performed, if possible, without exposing the patient. The *meatus urinarius* is indicated by a small projection, easily discovered by the finger, immediately beneath the vestibule, and in front of the vaginal entrance. The catheter being laid along the palmar surface of the forefinger, its point is guided towards the projection just mentioned, when, if the other extremity is gently depressed, it will usually pass in without the slightest difficulty. When the parts are distorted by disease, or by the tumefaction which occurs after labor, it is often necessary to expose the patient before the instrument can be introduced. The *urethra* is about one inch to one inch and a half in length, highly distensible, and, in the unimpregnated state, almost straight. In young children, what may be called the urinary parts of the vulva are prominent, and it is not till the approach of puberty, that the genital portion is observed to predominate.

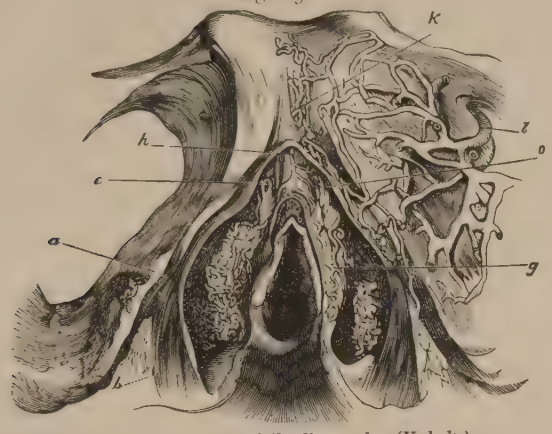
Behind and beneath the meatus is the orifice of the vagina, varying greatly in appearance and dimension in young girls, in those who are no longer virgins, and in those who have borne children. In virgins, it is generally closed to a considerable extent by a thin fold of the mucous membrane called the *hymen*, which was at one time supposed to be the "seal of virginity," but which may be ruptured by many causes other than coitus. Its usual form is crescentic, with the concavity upwards, closing in the posterior, and, to some extent, the lateral portions of the opening; but it may present itself under various other forms. It has been frequently observed, for example, to be circular, with a small perforation in the centre; or cribriform, with several perforations, as in a medico-legal case which the writer was called upon to examine; or infundibuliform, or offering rarer peculiarities. In some instances, the closure is complete. But, whether complete or partial, or under whatsoever form it may present itself, the first effects of coitus are generally sufficient to rupture this fragile partition. In rare cases, however, its texture is so firm and resistant, that penetration is rendered impossible until the structure has been divided by the scalpel; and in cases of complete closure, where there is no question of coition, the operation may be necessitated from its being a barrier to the menstrual flow.

When the hymen is absent, small projections, called *carunculæ myrtiformes*, generally about three or four on each side, are noticed on the margins of the opening. These were generally supposed to be the remains of the ruptured hymen; but, as they have been found to exist along with the hymen, this must be looked upon as open to doubt.

Blood-vessels are supplied in abundance to all parts of the external generative organs, and in certain situations the masses of venous plexuses which are termed *erectile tissue* are found in considerable quantity. Fig. 15, from Kobelt, shows these structures carefully dissected. Besides the erectile parts already mentioned, there are,

on either side of the vaginal orifice, two large leech-shaped masses, *a*, called *bulbi vestibuli*, which are about an inch in length, and are connected with the crura of the clitoris and the rami of the pubis, covered internally by the mucous membrane, and embraced on the outside by the fibres of the constrictor vaginæ muscle. A small

Fig. 15.



External Organs, partially dissected. (Kobelt.)

plexus—the *pars intermedia* of Kobelt—has direct vascular connection with the bulbs. These erectile tissues receive their blood from the internal pudic arteries.

The *Vagina* (*va*) is a membranous and highly dilatable tube, which serves to connect the vulva with the uterus. It is situated in the true pelvis, between the bladder and rectum anteriorly and posteriorly, and the levatores ani muscles at the sides. Its axis is a curve, which corresponds in some degree to that of the pelvis; and, in consequence, its anterior is shorter than its posterior wall, the former being about four, and the latter five or six inches in length. It is narrowest at the vulva, where it is embraced by the constrictor vaginæ muscle, and widest at its middle part, where it is extended transversely, owing to its being compressed by the organs before and behind. The thickest part of the tube is its anterior wall, where it is intimately connected with the bladder, and with the urethra, which is, as it were, imbedded in it. Its connection with the levatores ani muscles and the rectum is much looser, which admits of easy dilatation, and this also accounts for the fact that the rectum is rarely dragged down in uterine displacements, while the bladder is, from its closer connection, almost invariably altered in its relations. In the upper part of its posterior surface, it is separated from the rectum by a double fold of serous membrane, which forms a pouch of the peritoneal cavity.

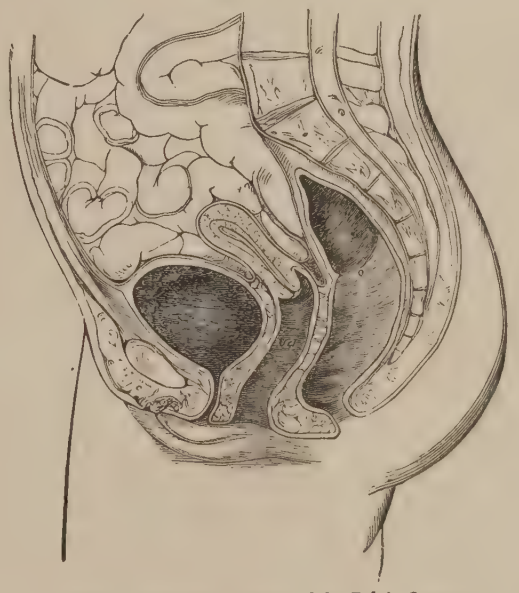
The external layer of the vagina is composed mainly of dense areolar tissue, beneath which there are two indistinct layers of muscular fibres of the unstriped variety, the external being disposed longitudinally, while the internal are circular in their direction. Around the tube, a layer of loose erectile tissue has been found, which is most distinct at the lower part. Internally, it is lined throughout by mucous membrane, which is covered with epithelium of the squamous variety, and is continuous in one direction with the skin and in the other with the mucous membrane of the uterus. Along the anterior and posterior walls, the membrane is slightly raised in the middle line, so as to form a ridge similar to the raphé in other parts. These ridges are called *columnæ rugarum;* and, at right angles to them, the membrane is thrown into numerous transverse folds (*rugæ*) which are always more distinct in those who have not borne children, and which are obviously destined to facilitate the dilatation of the parts.

The upper part of the vagina embraces the neck of the uterus in such a manner that the vaginal mucous membrane is reflected over the neck of the uterus some way above its mouth, the point of reflection being higher on the posterior wall; and it has been observed that the connection between this membrane and the subjacent uterine tissue is very firm close to the mouth of the womb, and is much less so as it approaches the point of reflection. This admits of the complete dilatation of the uterus, and the consequent obliteration of the neck. The other tissues of the vagina are continuous, or at least very closely united, with the corresponding tissues of the uterus. A reference to fig. 16 will serve to show that the vagina terminates in a cul-de-sac above and behind the uterus, and that at this point its wall is for some distance in direct relation with the peritoneal cavity, a fact of no little practical importance. The cul-de-sac of the peritoneum with which it is in contact is termed the *recto-vaginal pouch*, and sometimes the *pouch of Douglas*.

Further, the vagina may be considered as the organ of copulation in women; and as the canal which is destined to transmit the menstrual discharge, and, in case of pregnancy, the product of conception. It is abundantly supplied with vessels and nerves. The blood supply is derived from the vaginal and other branches of the internal iliac artery, and returns by means of corresponding veins, after forming at each side a vaginal plexus. The nerves have been traced to two sources, the hypogastric plexus of the sympathetic system, and the fourth sacral and pudic nerves of the spinal system.

The external organs of generation are furnished with numerous glands of various kinds, which have been very fully described by MM. Robert and Huguier. The latter divides the glands of the vulva and entrance of the vagina into sebaceous and muciparous follicles. The *sebaceous* variety is met with in great abundance over the whole of the parts from the genito-crural folds to the clitoris and nymphæ. Those of the nymphæ are exclusively

Fig. 16.



Showing the relative position of the Pelvic Organs.

sebaceous, and they all find their function in the secretion of an oily fluid, which maintains the elasticity, moisture, and sensibility of the parts, prevents them from adhering, and, above all, protects them from the irritating action of the urine. The *muciparous* follicles differ essentially in their situation, and in the nature of the fluid which they secrete. Although here and there they are isolated, as a general rule they are found in groups. One such group of eight or ten follicles is found imbedded in the mucous membrane of the vestibule. Another is observed in the immediate neighborhood of the meatus urinarius, their orifices being extremely minute, and opening for the most part below the aperture of the meatus, upon, or close to, the little tubercle already described. A third group is described as external to these, and situated on either side of the urethra; and a fourth, the orifices of which have been observed on each side of the vaginal opening, at the root of the hymen or carunculæ myrtiformes.

Under the muciparous class, two compound or conglomerate glands were long ago described by Bertholin, and more recently

by anatomists under the name of the *vulvo-vaginal glands*. They are also called the glands of Duverney, and are in many respects analogous to Cowper's glands in the male. They are about the size of a small bean, variable in form, and of a reddish-yellow color. Their development is said to proceed, *pari passu*, with that of the ovaries, reaching the maximum during the child-bearing period, and being comparatively insignificant in youth and old age. They are situated one on each side, at the entrance of the vagina, beneath the superficial fascia, with their inner surface united to the vagina by areolar tissue, and the outer surface in relation with the constrictor muscle of the vagina. Each of the lobes of which the gland is composed gives origin to a little duct, all of which conduits ultimately unite at the internal and upper part, to form a common excretory duct, which proceeds horizontally forwards as far as the vaginal orifice, where it terminates within the nymphæ, and external to the hymen or carunculæ myrtiformes. The orifice is very small and valvular, and is often only to be discovered with difficulty; but its situation is usually indicated by an increased vascularity at the point whence it emerges. These glands secrete a fluid (resembling that which is found in the prostate in the male) which is increased in quantity during coition, and is said to be expelled in jets, as occasionally occurs with the contents of the salivary duct. By lubricating the parts it facilitates coition, and by preserving their moisture probably tends to maintain their extreme sensibility.

The appearance and anatomical relations of the external organs of generation vary greatly according to age, and in consequence of venereal indulgence, or of child-bearing. At birth, the nymphæ project beyond the level of the labia majora, and the parts in general look more forward than in the adult. When puberty approaches, hair appears on the pubes, the nymphæ disappear between the labia, and the parts look downwards, so that in the erect posture nothing can be seen from before except the mons veneris; whereas, in the child, the upper parts of the vulva are distinctly visible. The labia are symmetrical, thicker above than below, closely applied to each other, and of a fresh rose color on their mucous surfaces. Venereal indulgence, and, still more, pregnancy and child-bearing, modify, in a great measure, the appearance here described. The hymen is ruptured, and the carunculæ myrtiformes come into view. The labia lose their regularity and become of a more dingy hue on their mucous surface. The nymphæ are again visible, partly by separation of the labia, and partly in consequence of hypertrophy of their tissue, while their vivid rose tint becomes replaced by a darker shade of color. In some cases the hypertrophy is very remarkable, and when so, is usually unequal on the two sides. This is said to be very common among Hottentot women, where the nymphæ often become enormously enlarged. In women who have borne children the fourchette is usually ruptured, and the vaginal orifice remains large and irregular. The vagina again, which in virgins presents the appearances already described, may now lose, to a great extent, its rugæ; and the deepening of its color is by some supposed to be a not unimportant sign of pregnancy. In women of advanced age the vagina becomes contracted, being again thrown into folds, and greatly diminished in calibre. Its orifice shares in the contraction, the nymphæ shrink, and the labia majora come once more into proximity, while the glandular, erectile, and other special tissues become atrophied. In a word, the characteristics of childhood are again partially restored.

Abnormal conditions, constituting some form or other of congenital malformation, are occasionally met with in the external organs. The labia may be imperfect or rudimentary, preserving in this respect the fœtal condition of the parts; they may be developed on one side only; or they may present the appearance of several folds. In cases of deficiency of the lower part of the abdominal wall and of the bladder, along with separation of the symphysis pubis, the labia are imperfectly formed and set wider apart than usual. The posterior commissure of the vaginal orifice may be hypertrophied and pushed forwards so as to cover the aperture. The labia are, in some instances, adherent along the median line, to such an extent that an opening is left sufficient only for the passage of the urine. Induration and hypertrophy such as to constitute elephantiasis has also, although rarely, been noticed. Entire absence of the clitoris, unassociated with any other form of malformation, is very rare. It is sometimes so small that it can with difficulty be discovered, and in these cases it may be erroneously supposed to be absent; but it may be assumed that, unless other parts, such as the nymphæ, are absent, the clitoris is only rudimentary. This organ is much more frequently enlarged, generally, no doubt, as the result of disease, but sometimes it is a pure hypertrophy of the normal tissues, when it may approach the dimensions of the penis, and constitute one of the forms of so-called hermaphroditism. An extreme development of the nymphæ—common, as we have seen, in certain races—may occasionally be met with as a peculiarity of structure; and cases are even recorded where they have been found increased to two or even three pairs.

The folds of which the hymen is composed, ordinarily thin and fragile, are occasionally developed to such an extent as to prevent sexual congress; while, in some cases, it completely closes the mouth of the vagina, preventing not only coition and impregnation, but also menstruation, and, for the latter reason, if not for the former, rendering an operation necessary. Another condition of these parts which may call for operative interference is what has been called *vaginismus*, where there exists such spasmodic contraction as prevents proper sexual contact, dilatation with or without the use of the scalpel being in such cases often found necessary. Congenital absence of the vagina is by no means of very rare occurrence. In extreme cases, the whole organ is wanting—the vulva terminating abruptly at the point where the vagina, in the ordinary condition of parts, commences. In others, a portion of the tube exists, but ends in a cul-de-sac at some distance from the os uteri; while, in another class, there is a narrow canal, sufficient only for the passage of the menstrual fluid. In many of these cases, free incision may be found necessary, in order, by giving egress to the menstrual discharge, to relieve the serious symptoms which arrest of that important function is apt to engender.

A vertical septum occasionally exists, constituting the phenomenon of double vagina, in which, if complete, there is a hymen to each tube. More frequently, however, the septum is incomplete—either commencing at the vulva and terminating so as to leave the tube single at its upper part, or, conversely, commencing at the upper part and stopping short of the mouth of the vagina. In the latter case, we would expect it to be associated with double uterus. Transverse membranous septa also exist as congenital malformations, but much more frequently as the result of inflammatory action, or of the accidents of previous labors.

Many of the conditions above detailed may give rise to serious impediments, either to delivery, to impregnation, or to the proper performance of the menstrual function, and, in consequence, delicate, and even dangerous, operations may, under such circumstances, be required.

Mammary Glands.—Intimately associated with the function of the reproductive system are the glands, the presence of which serves to distinguish the class Mammalia. On this account several modern writers have, with perfect propriety, included these organs in a description of the external parts of generation. When they are fully developed in a woman, they extend from the third to the sixth or seventh rib, and from the side of the sternum to the axilla, the left breast being generally the larger of the two. The nipple (*mamilla*) projects about the level of the fourth rib from near the centre of the gland, and is, in the virgin, of a rose pink color. It is surrounded by a ring of similar hue (*areola*), varying in tint with the complexion of the individual. On the surface of this several small tubercular projections are visible, on each of which are the orifices of several glands. The tissue of the nipple is very rich in blood-vessels, and contains muscular fibres of the non-striated variety with a certain amount of erectile tissue, the surface being covered with papillæ, which are highly sensitive. The turgescence

of the nipple, which occurs under irritation, is usually attended with a pleasurable sensation.

The bulk of the breasts, and what gives to them their smooth and moulded form, is chiefly fat, which, except at the nipple and areola, where the gland is contiguous to the surface, lies beneath the skin, and dips down into the intervals between the lobes and lobules of which the gland is composed. Each of these lobes is enclosed in a distinct cavity (*loculus*, fig. 17, 4), has a separate excretory duct, and is subdivided again and again into smaller lobes, and ultimately into terminal lobules. Within the latter, by a process of cell development, and multiplication of nuclei, the milk is eliminated from the surrounding vessels. The fluid, on the rupture of the cells, passes into the terminal ramifications of the ducts; which by their junction form larger canals termed *galactophorous ducts*. The milk being thus brought from the various lobes, these ducts, from fifteen to twenty in number, converge towards the areola, beneath which they become considerably dilated into sinuses, 6, which serve as temporary reservoirs for the milk. Between this and the nipple the ducts again become contracted, 5, and proceed from the base of the nipple towards its summit without communicating, each discharging its contents by a special orifice. The walls of the tubes and sinuses are composed of areolar tissue, with longitudinal and circular elastic filaments. Irritation of the nipple, either by contact of the child's mouth or otherwise, causes a relaxation of the orifices, and, at the same time, contraction of the walls of the sinuses, causing the milk to flow abundantly. Not unfrequently a spasmodic contraction takes place independently of any special excitement, the result being the involuntary expulsion and

Fig. 17.

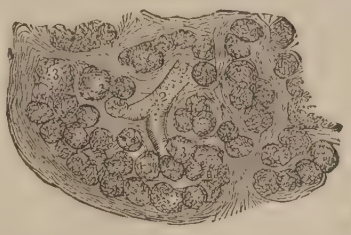
Dissection of the lower half of the Female Mamma during the period of Lactation. (Luschka.)

loss of the milk. The well-known sympathy which subsists between the glands and other organs, such as the stomach and uterus, may give rise to similar phenomena, whilst that which exists between the breasts of each side often results in the spasmodic emptying of one gland while the child is at the other.

The lacteal vessels are lined throughout by a mucous membrane, continuous at the nipple with the common integument, and which is invested by a tessellated epithelium. They are accompanied in their whole course by numerous lymphatics, which are connected intimately with those of the axilla and other neighboring parts. These lymphatics are believed to take up the watery portion of the milk, and it is supposed to be by their action that frictions are beneficial in cases where we wish to diminish or arrest the secretion of milk. They receive their blood from the internal mammary, axillary, and intercostal arteries. The veins form round the nipple a circle or plexus, which is usually called the *circulus venosus* of Haller. In the latter months of pregnancy the pressure of the gravid uterus tends, as Mr. Nunn has pointed out, to increase from mechanical causes the quantity of blood in these vessels, and thus to promote the secretion of the gland.

Fig. 18, from Henle, represents a section from a small lobule of the gland, magnified 60 diameters: 1, shows the stroma of the connective tissue which supports the glandular structure; 2, terminal ramuscule of one of the gland tubes; 3, glandular vesicles. Fig. 19 shows several of the glandular vesicles, magnified much more highly, about 200 diameters. The secreting epithelial cells which line the vesicles are here represented, while the cavities contain a certain number of milk globules.

Fig. 18.



Structure of a Lobule of the Mammary Gland.

Fig. 19.

Ultimate Glandular Vesicles of the Mamma.

In the male, the mammary gland exists, but is rudimentary. Various anomalies in structure have been met with, such as two or three nipples on one gland, or an additional mamma or even mammæ. In the latter case, the supernumerary glands are usually near their ordinary site, but sometimes they have been found in a distant part of the body—as the axilla, thigh, or back.

The Internal Organs of Generation. These are the Uterus, the Fallopian Tubes, the Ovaries, with various ligamentous and other structures intimately connected with them.

The *Uterus*, when unimpregnated, and at mature age, is situated deeply within the true pelvis, between the bladder and the rectum in front and behind, and intimately connected at its lower part, as we have already seen, with the vaginal wall. The function which it has to discharge is to receive the product of conception after it has passed through the Fallopian tube, and to maintain it within its cavity until, at maturity, it is expelled. The usual comparison of it to a pear, flattened from before backwards, gives one a very correct idea of its form. It is a hollow organ, with remarkably thick walls; and is so placed in the centre of the pelvis, that its upper part looks upwards and forwards, and its lower or vaginal part downwards and backwards. It is generally assumed, as sufficiently correct for all practical purposes, although by no means absolutely accurate, that its axis corresponds with that of the pelvic brim, or, in other words, that its axis, if carried downwards, would pass at the same time backwards, and cut the horizon at an angle of 30°.

The uterus is divided into two parts: the *body*, which is much broader; and the *neck*, which is nearly as long as the body, but much narrower. The point of division between these two parts is frequently indicated externally by a slight constriction.

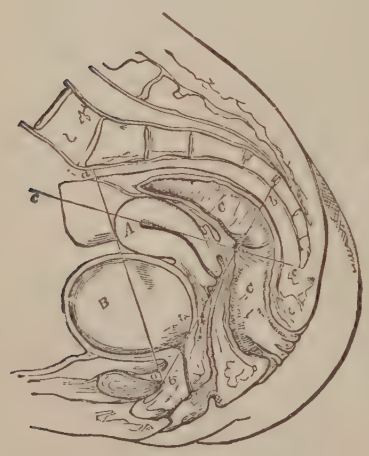
Till about the fourteenth or fifteenth year, this organ is of small size, but a considerable increase takes place at the period of puberty. In women who have borne children its volume is permanently increased, although it is sometimes found in advanced age to have resumed in some measure the appearance presented in early life. It is temporarily increased in size during a menstrual period; but if examined during the interval, the virgin uterus will be found to weigh on an average about 500 grains, and to measure, in length three inches, in breadth about two inches, and in thickness (*i. e.*, from before backwards) one inch. Its situation varies according to age. In the fœtus it is altogether above the brim, but from this position it gradually descends after birth, although it is not till the tenth year or even later that the fundus falls to the level of the brim plane. The uterus is, when healthy and normal, united with the surrounding parts by means of certain structures to be described presently. The nature of this union is essentially lax, admitting of

pretty free movement in all directions, which may easily be tested by the finger, and which enables it to accommodate its position according to the degree of distension of the neighboring hollow viscera. This laxity admits too of the free expansion of the uterus during the course of pregnancy, but unfortunately it may also give rise to certain displacements, which will be duly considered in the proper place, in so far as these have a bearing upon the practice of midwifery.

The axis of the virgin uterus must, therefore, be constantly changing, now backwards and now forwards, according as vesical or rectal distension prevails. It is thus a matter of no little difficulty to determine what may be regarded as the normal axis of the uterus, and in all attempts which have been made by anatomists with this view, it has been usual to consider the parts to be in their normal relative position when the bladder and rectum are each moderately distended. The opinion which is usually adopted, and which is founded on estimates of this nature, is, as has been said, that the axis of the uterus is identical with the axis of the pelvic brim. It is admitted that, in many cases, and especially in those in which the vagina is very short, the fundus falls more or less backwards so as to bring the uterine axis more into a line with that of the vagina, while in some cases the uterus is curved so that the body forms an angle with the neck.

This bending of the uterine axis, instead of being admitted as an exception, is recognized by many of the best authorities as the normal position of the womb, a view which careful personal observation leads us to confirm. It is a point of great importance, in making examinations on the living subject, that it should be clearly recognized that the finger, on a digital examination, approaches the os uteri in a direction corresponding to the axis of the vagina, which frequently forms nearly a right angle with the uterus. If this is overlooked, error is sure to creep into our calculations, as has evidently been the case in certain instances of inaccurate description of the anatomical relations of the womb. The opinion here expressed as to the position of the womb is in accordance with that of Kohlrausch, as shown in his plates, and is confirmed by Dr. A. Farre in his admirable essay in the *Cyclopædia of Anatomy and Physiology*, from which the diagram (fig. 20) is taken. According to these able observers, when the bladder B and the rectum C are moderately distended, the fundus of the uterus is directed upwards and forwards, and the neck downwards and very slightly backwards towards the orifice of the rectum. The relative heights of these parts are determined, it is assumed, by two lines: the one, *a*—*a*, being drawn from the lower border of the symphysis pubis to the promontory of the sacrum, to mark the height of the fundus; and the other, *b*—*b*, carried from the same point anteriorly to the lower margin of the fourth sacral vertebra behind, to mark the plane of the orifice of the uterus. The line *c*—*c* indicates the axis of the body of the uterus. The representation, therefore, given in fig. 20, is, as regards the position of the womb, probably nearly correct, subject, of course, to numerous modifications, in consequence of its mobility, and the influence exercised upon it by neighboring organs.

Fig. 20.



Diagram, showing relative position of Pelvic Viscera. (A. Farre.)

The interior of the uterus corresponds in some measure with its external surface. It is divided into two parts by a constriction not far below its middle, indicating the point at which the cavity of the cervix ends, and that of the body begins. This constriction, which is the usual cause of the difficulty experienced in passing the instrument known as the uterine sound, is called the *os uteri internum*, the orifice communicating with the vagina being named the *os tincæ*, *os externum*, or, more generally, the *os uteri*. In a profile section (fig. 21) the anterior and posterior walls are shown to be almost in apposition, this being, however, more complete at the internal os, *o*. From this point the cavity of the body extends upwards to the fundus, while that of the cervix reaches downwards, and terminates at the external os. The neck of the uterus is divided, as will be observed, into two portions, upper and lower, by the point of reflection of the vaginal mucous membrane, the lower part being called the vaginal part of the cervix. Viewed thus, the os is composed, as may be noticed, of two lips, *a*, anterior, and *p*, posterior, of which the former is generally described as the longer. This, however, which is more apparent than real, is caused by the position of the uterus as regards the pelvis, which brings the anterior lip lower in the vagina, and thus makes it seem longer than it really is in reference to the long axis of the organs. The vagina reaches somewhat higher on the posterior than it does on the anterior lip.

If we now make a transverse section as shown in the accompanying diagram (fig. 22) it is to be noticed, in the first place, that the cavity of the cervix, as well as that of the body, is expanded from side to side, owing to the approximation of the anterior and posterior walls as shown in the previous figure. The cavity of the cervix then is, being somewhat flattened from before backward, irregularly fusiform. Its lining membrane presents a peculiar appearance, being thrown into irregular folds, which branch laterally from a raphé or median line, in a direction generally upwards. This

Fig. 21.

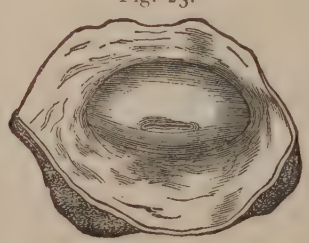
Profile Section of the Uterus.

Fig. 22.

Transverse Section of the Uterus.

arborescent appearance has given rise to the name under which it is known to anatomists, the *arbor vitæ uterinus*, and it has been observed that in the uteri of very young children these folds are traced much higher than in the internal os, which is their limit in the adult. The cavity of the body is from this point of view triangular in shape, smooth on its surface, and having three openings leading into it, one at the internal os or apex of the triangle, and one at each angle of the uterus, leading right and left into the Fallopian tubes. Some rare instances of congenital absence of this cavity have been recorded: what is more common is adhesion of the walls in old age.

Fig. 23.



Os Uteri.

The os uteri, as felt by the finger, or as seen through the speculum, is a transverse opening or slit, which, in the virgin, and in the absence of structural disease, is perfectly smooth. In these circumstances the aperture is closed, but the depression between the

lips is easily felt, and is precisely similar, in the impression it communicates to the finger, to the sensation experienced when the finger is applied to the tip of the nose. In this case the cartilages represent the firm tissue of the lips, while the vertical interval between them corresponds to the transverse slit which constitutes the os.

The characteristics above described are those of the virgin, or, as Dr. Tyler Smith more correctly calls it, the "nulliparous" uterus. During pregnancy, the organ is enormously distended, and the anatomical relations of the contiguous parts are greatly disturbed. After delivery, the parts contract, and regain in a great measure their original appearance and condition, but they nevertheless retain features of dissimilarity, which generally enable the observer, on a careful examination, to distinguish the uterus of a woman who has been a mother. The chief points of distinction are as follows: The weight of the organ is increased, according to Meckel, to about an ounce and a half; the fundus and body are rounded externally; the cavity of the body loses its triangular shape, and becomes much larger relatively to the cervix, the os internum being agape. The arborescent folds of the cervix are in a great measure obliterated, or at least are rendered indistinct, and the os externum is patent. The differences in the latter are, from the fact of its being of easy access to the finger, of special importance, and consist mainly in an enlargement of the parts, and an irregularity in the surface of the lips, which are now no longer smooth, but puckered round the edge of the os, and often nodulated on the surface. These irregularities are due to slight lacerations of tissue which occur during delivery. They are always more marked in women who have borne many children, where the lips are not unfrequently divided into lobes by shallow furrows, representing these lacerations, and which radiate from the os as from a centre. These fissures are generally observed at the sides or angles of the os, and are, according to Cazeaux, much more marked on the left than on the right side.

The uterus, then, as may be inferred from what has been said, presents a fundus, more or less rounded according as the woman has or has not borne children, two borders laterally, and an anterior and posterior surface, of which the latter is the more convex. It consists of three constituent layers: a serous or investing coat; a mucous or lining coat; and an intermediate thick layer of fibro-muscular structure constituting the proper tissue of the uterus. Each of these requires special and very careful consideration.

The Serous Coat.—Along with this we shall consider certain structures very intimately connected with it which are described as the *Ligaments of the Uterus*. The great serous membrane, which invests almost the whole of the abdominal viscera, is also reflected over the greater part of the womb. Passing backwards over the fundus of the bladder, the peritoneum becomes reflected upwards on the anterior surface of the uterus from a point which in the virgin uterus is about midway between the os externum and internum, a space being thus left (see fig. 16) through which direct communication may take place between the uterus and the bladder. This may occur as an accident in midwifery practice, constituting a vesico-uterine fistula, as in a case reported by the writer.* From the front to the back of the uterus, the membrane now passes over the fundus, and investing the whole of the posterior surface with the exception of the vaginal portion, reaches downwards behind the vagina, in the manner already described, to form the pouch of Douglas. The manner in which the uterus is thus embraced by the peritoneum in its course from before backwards is peculiar. Instead of investing the lateral parts of the organ in the same manner as the anterior and posterior walls, it is stretched from side to side of the pelvis, forming, in fact, a double layer of peritoneum, in the centre of which the uterus is confined. These folds, intimately connected on either side with important organs to be presently described, are the *broad ligaments* of the uterus.

Looking from above downwards (fig. 24) in the axis of the brim, it will be noticed that the broad ligaments, with the uterus *u*, form a partition or curtain, dividing the cavity of the pelvis into

* Glasgow Medical Journal, 1862.

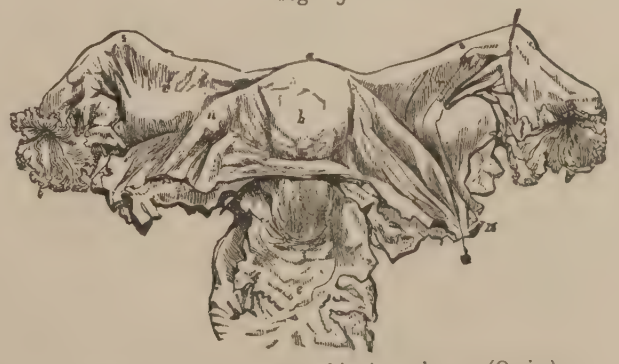
Fig. 24.

Pelvic Organs *in situ*, viewed in the Axis of the Brim. (After Schultze.)

two parts, anterior and posterior, of which the anterior is occupied mainly by the bladder, *b*, and the pouch which separates it from the womb, and the posterior by the rectum, *r*, and the pouch of Douglas. It will also be observed that the greater convexity, and, indeed, the bulk of the uterus, projects into the posterior of the two cavities. The attachment of the broad ligament is, in point of fact, to the anterior lip of the lateral border of the womb.

If, therefore, the uterus and the broad ligament are viewed from before, as in fig. 25, the fundus and body of the uterus are indeed indicated, as well as the situation of other parts to be mentioned immediately, and the relation which they all bear to the vagina; but the parts themselves are only to be distinctly demonstrated by turning our attention to the posterior surface of the pelvic partition, as shown in fig. 26, where the posterior wall of the uterus has been removed, in order to show the interior of the organ. The peculiar structure of the cavity of the cervix, the anterior lip of the os, and the anterior wall of the vagina are also shown, as also the triangular space bounded inferiorly by the ovary and its ligaments, which, from a fanciful resemblance to a bat's wing, has been called *ala vespertilionis*.

Fig. 25.



Anterior View of the Uterus and its Appendages. (Quain.)

It is thus very apparent that the effect of the broad ligament is to maintain the uterus in its central position as regards the pelvic cavity, and to prevent its displacement downwards, while it admits of very free antero-posterior movement, corresponding to the distension of the bladder or rectum.

Between the two layers which constitute the broad ligament, and occupying each a fold more or less distinct, are the following structures: the *round ligament* (see fig. 24), a cord-like bundle of fibres, partly muscular, and about four and a half to five inches in

length, which has its course on each side from the angle of the uterus, first upwards and outwards, and then forwards and a little inwards to the internal inguinal ring. Passing, like the spermatic

Fig. 26.

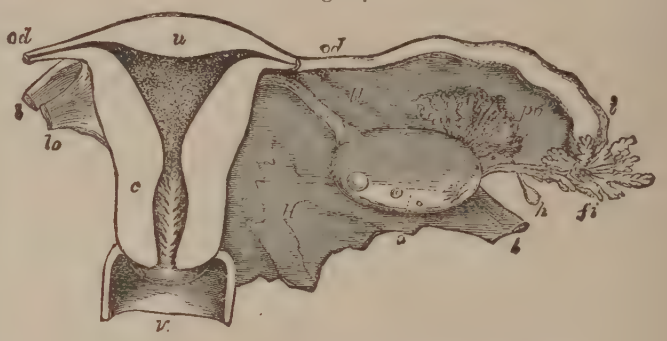
Posterior View of the Uterus and its Appendages. (Quain.)

cord in the male, through the inguinal canal, and invested by a peritoneal sheath called the canal of Nuck, its fibres expand and are lost in the mons veneris, some of them having been traced to the purse-shaped cavity in the labia majora already described. According to Madame Boivin, the ligament of the right side is a little shorter and thicker than the other. Two small semilunar folds are seen on this aspect, which are formed by the peritoneum in its passage from the uterus to the bladder, and which limit laterally the pouch existing between these two organs. They are called the *vesico-uterine* ligaments. The uterus is generally observed to be a little more to the right than to the left side; and it is asserted by Schultze that, in the normal position, it is somewhat twisted on its axis so as to turn the anterior surface a little to the right. On this observation is grounded a theory which Schultze has propounded as to the position of the child in the womb. All this is shown in fig. 24.

Reverting now to the posterior surface of the broad ligament, we find several parts which are of the highest physiological importance. At the upper or free margin of the broad ligaments, and occupying a portion of the space between its layers, there extends from each angle of the uterus a thick cord, between three and four inches in length, at first nearly straight in its direction, but in its outer half pursuing a somewhat tortuous course, especially in young subjects. This is found, on dissection, to be traversed in its whole extent by a canal of small diameter, and is familiarly known to anatomists as the *Fallopian tube* (*oviduct*). It is composed in a great measure of muscular tissue of the non-striated variety, which is disposed in layers, an external one of longitudinal, and an internal of circular fibres. Along with this is areolar tissue, the whole being embraced by the peritoneum in the manner described. The canal is lined with mucous membrane, with an epithelium of the columnar and ciliated variety, continuous at one extremity with the mucous membrane of the uterus, and at the other with the inner surface of the peritoneum—a unique example of a mucous being continuous with a serous membrane, and of a serous cavity which is not absolutely a closed sac. The tube is small, and its cavity narrow at the uterine end, barely permitting the passage of an ordinary bristle, but it becomes dilated in its course outwards, and ultimately expands into the trumpet-shaped extremity from which it derives its name (*tuba*). The mucous membrane lining the canal is disposed in longitudinal folds, so that in a transverse section of the structure the cavity presents a stellated appearance. The mouth of the tube has a very irregular and fringed margin, hence its name of *fimbriated extremity*—the fimbriæ being arranged in a circular manner, and surrounding the orifice, which looks downwards in the direction of the ovary. With this organ it is in fact connected by an elongation of one of the fimbriæ. When the ovum comes to maturity within the ovary, that portion of the organ from which it is about to escape by dehiscence is firmly grasped by the fimbriæ (*morsus diaboli*), and the ovum is received into the oviduct, and by it conducted to the uterus, where it is retained and developed, or whence it is discharged, according to circumstances.

Leading from the inner extremity of the ovary—an organ to be hereafter described—is a dense cord, composed mainly of fibro-areolar tissue, but containing also muscular fibres. This is the *ligament of the ovary*, which is also, like the round ligament and the Fallopian tube, firmly united to the angle of the uterus at a point behind and below the latter, and is about an inch and a half in length. The *parovarium* or Organ of Rosenmüller (fig. 27, *p o*), is situated between the layers of the broad ligament, and can usually be brought into view by holding up to the light that portion of the ligament which is between the outer part of the ovary

Fig. 27.



Diagrammatic View of the Uterus and its Appendages as seen from behind. (Quain.)

and the Fallopian tube. According to the observations of Kobelt and Follin, the parovarium is usually composed of from seven to ten tubules, which are convoluted and end in a cul-de-sac, all converging towards the tube through which the vessels of the ovary pass. These tubes exist at all ages, but are more distinct in children, and still more so in the fœtus. In no instance have they been found to have an orifice, but there seems good reason to believe that they correspond to the epididymis of the male, more especially the coni vasculosi, and are therefore the vestiges of the upper part of the Wolffian bodies of the embryo. It is more than likely that the cysts which so frequently originate in this situation have some anatomical connection with the parovarium. From the back of the uterus on each side, crescentic folds of peritoneum pass backwards towards the rectum (fig. 24). They are more marked than the vesico-uterine folds, previously described, and are called the *posterior* or *recto-uterine* ligaments, or folds of Douglas, as they mark the upper boundary of the pouch with which the name of this anatomist is associated.

That muscular fibres exist between the layers of the broad ligament is a question no longer open to doubt; and there seems good reason to believe, from the researches of Rouget and others, that this is only a portion of a continuous envelope of muscular fibres, embracing the uterus, Fallopian tubes, and ovaries. These fibres are believed to exercise an important physiological function, in bringing all the structures into harmonious action, and more especially in insuring the precision with which the fimbriated extremities of the Fallopian tubes grasp the ovaries.

The uterus is thus—by means of its ligaments and other auxiliary structures—so suspended in the cavity of the true pelvis as to admit, as has been shown, of tolerably free movement, and at the same time to restrict its mobility within certain limits. The movement of the body from side to side is curtailed effectively in a healthy state of the parts by the broad ligament, while displacement backwards is prevented by the vesico-uterine folds and the round ligament, and movement in the contrary direction by the recto-uterine ligaments. Undue importance must not, however, be attached to the functions of these structures as ligaments; for it is very obvious that other parts (and in an especial degree the vagina) aid them in holding the uterus thus in suspension. The general laxity of all these tissues, however, which nature permits in view of the higher function of the uterus, is very apt, under disturb-

ing influences, to give rise to displacements which have already been referred to, but the consideration of which belongs more properly to the department of gynæcology. It may, however, be observed that the symptoms of these displacements are, in a great measure, mechanical, and the direct result of the loss of equilibrium—as those, for example, which arise from pressure on the bladder or rectum, and the pain in the groin frequently experienced in retroversion, which is assumed by Cazeaux to arise from tension of the round ligament.

In the interval between the two layers of the broad ligament, and associated with the other structures above described, there is found a considerable quantity of loose and extensible cellular tissue. This admits of a complete alteration in the anatomical relations of the parts which occurs during pregnancy, and this is further provided for by the manner in which the uterus is attached to its serous investment. The nature of the connection is firm at the fundus, and lax at the sides, where the peritoneum may be moved by the finger to and fro upon the subjacent tissue of the organ. The manner in which the neighboring parts accommodate themselves to the distension of the womb during pregnancy will fall to be considered in a subsequent chapter.

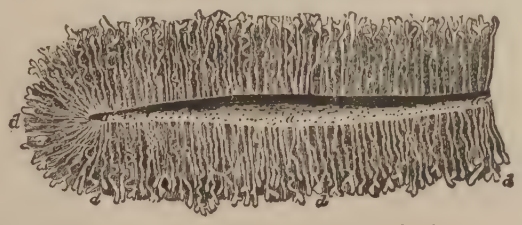
CHAPTER IV.

FEMALE ORGANS OF GENERATION—*CONTINUED.*

The *Proper Tissue*, which lies immediately beneath the peritoneum, and which constitutes the greater part of the walls of the uterus, is very dense in structure, and except during pregnancy or a menstrual period, is of a grayish color in section, and displays numerous blood-vessels, some of them of considerable size. It is thickest at the middle of the body and at the fundus, thinnest at the Fallopian tubes, and is composed throughout of bundles of muscular fibres of the plain variety. These fibres in the unimpregnated condition are interlaced, disposed very irregularly in bands and layers, and mixed with fibro-areolar tissue, which is more abundant near the external surface. As in the case of other hollow viscera, the muscular elements may be described as consisting of an external layer, the fibres of which have a general longitudinal direction, and of an internal or circular layer. From the irregular manner, however, in which, in the unimpregnated uterus, the bundles of fibres are disposed, and the intimate union which subsists between them, this seems on the first glance to be somewhat of a forced analogy. And it would probably remain so, were it not that during pregnancy the stratification of the muscular tissue becomes much more distinct, so as to render the comparison quite justifiable, a fact which will be brought out more clearly afterwards. Anatomists usually divide this tissue into three layers, external, intermediate, and internal.

Mucous Membrane.—The very existence of this membrane was long disputed, the obvious reason being that it differs so much from other mucous membranes, that physiologists, with some show of reason, refused to admit the analogy. More modern and more exact observations, however, leave no doubt as to the propriety of classifying it as it is here named. The descriptions which are usually given of this membrane by anatomists are very meagre, and in some respects inaccurate; this may serve as our warrant for examining its structure and functions a little more in detail than under other circumstances might have been necessary. It is probably the thickest mucous membrane in the body, constituting, in the cavity, about one-fourth of the entire thickness of the organ. In this situation, it is of a reddish tint, but in the cervix, where it is much thinner, it is paler in color, the thinning occurring somewhat abruptly at the os internum. It is firmly adherent to the subjacent muscular tissues, and cannot, in consequence of the sparseness of the submucous cellular tissue, be made to glide upon the part which it covers. The surface of the membrane is smooth, and abundantly studded over with minute dots, which are found on closer examination to be the orifices of numerous tubular glands, which run through the entire thickness of the membrane in a direction perpendicular to its surface. Fig. 28 represents a part of the cavity of the uterus which shows in section the orifices of the glands (*a*), and the glands themselves (*d*). They were believed by Weber to be, at the commencement of pregnancy, greatly convoluted, and sometimes bifurcated at the extremities, as here represented. The more recent and exact observations of M.

Fig. 28.



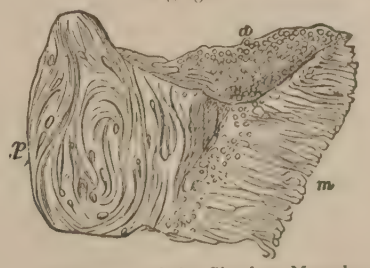
Tubular Glands of Uterus. (E. H. Weber.)

Robin show, however, that when *in situ*, they are rather undulated than convoluted, that they are never spiral, although, as in fig. 29, they may appear so when separated, and that they never bifurcate. During pregnancy and menstruation they become greatly enlarged, and sometimes cross each other, an appearance which in all probability has led to the idea of a division of the tube. They are simple tubular glands, parallel to each other, ending in a cul-de-sac, and penetrating the entire thickness of membrane. They are lined by nucleated ovoid epithelial cells, their walls being finely granular, and very firmly adherent to the tissue which intervenes between them. Their length measures exactly the thickness of the mucous membrane, and is much less, therefore, where the membrane becomes thinner, on its approach to the os internum and the orifice of the Fallopian tubes. "If we except that of the stomach," says M. Robin,* "there is no mucous membrane more rich in glandular follicles than that of the uterus." In the pig

Fig. 29.

Tubular Gland of the Uterus. (Coste.)

Fig. 30.



Relation of Tubular Glands to Muscular Tissue of Uterus. (Coste.)

and some other animals the epithelial cells which line the glands are ciliated.

In the unimpregnated uterus, in an inter-menstrual period, the

* De la Muqueuse Utérine. Paris, 1861.

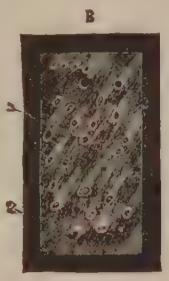
tubular glands are not very easily seen; but if their sections are treated with acetic acid or concentrated tartaric acid, and viewed by transmitted light, they can generally be made out. They terminate quite abruptly at the inner margin of the muscular coat, the point of junction being very distinctly indicated by the muscular fibres running at right angles with the tubes. The glands were supposed by Sharpey to penetrate the muscular tissue, but this view is now generally regarded as an erroneous one. Their abrupt termination is well shown by a reference to fig. 30. In the same preparation, which was taken from the uterus of a young girl who had committed suicide in the inter-menstrual period, is also shown the general direction of the fibres composing the proper tissue of the uterus, *p*, as compared with the course of the tubules from the free surface of the mucous membrane at *m*. At *a* the tubes are cut across, and shown obliquely in section, and the course of the blood-vessels which accompany them is also indicated between *m* and the adjacent part of the muscular tissue.

Fig. 31, also taken from Coste's beautiful plates, shows a detached portion of the mucous membrane in the same case. Little funnel-shaped depressions are shown at *a*, into which the orifices of the tubes open. The actual glandular orifices are distinctly shown elsewhere on the surface of the membrane. From one portion, the epithelium has been stripped off, so as to show the termination of the tubes free and floating. But what is most distinctly shown

Fig. 31.

Termination of Tubular Glands on Mucous Surface of Uterus.

Fig. 32.



Tubular Orifices of Uterus. (Sharpey.)

here is the perfect net-work of vessels which surround the orifices, which is always to be observed most distinctly at those seasons when the functional activity of the uterus is excited.

Fig. 32 is a small portion of the mucous membrane as observed after recent impregnation. This specimen is represented as viewed upon a dark ground, and also shows the orifices of the uterine glands, in most of which, as at 1, the epithelium remains, and in some, as at 2, it has been lost.

The mucous membrane is smooth on its surface, which is composed of columnar and ciliated epithelium. Cruveilhier describes it, however, as presenting indistinct papillæ, while some earlier physiologists insist that it is studded with free villi: errors which have probably had their origin, as M. Robin assumes, in the extremities of the glandular follicles becoming liberated from their epithelial attachment by *post-mortem* change, and which find in analogy an apparent corroboration in the condition of the membrane as observed in the uterine cornua of some mammalia. During pregnancy the epithelium becomes transformed; it loses all trace of the vibratile cilia, and the cells are changed from the columnar to the pavement variety.

Berres* was the author of the erroneous hypothesis that the villi of the placenta plunged into these glands to be there bathed in materials destined for the fœtal blood, a view which was afterwards supported by Bischoff,† but which now receives little if any support. M. Coste‡ was undoubtedly the first who gave a complete description of the mucous membrane during menstruation and the various stages of pregnancy. To him the merit is also due of having demonstrated, what is now all but universally admitted, that the maternal covering of the ovum (*decidua*) of which we shall have more to say, is not a new formation, as Hunter taught, but is the mucous membrane itself, altered and modified to suit the circumstances of the case. The views of Coste have received the most remarkable confirmation by the subsequent observations of Richard, and by the still more recent researches of Robin.

The mucous membrane of the uterine cavity is continuous at the angles with that which lines the Fallopian tubes. At the internal os, it becomes much thinner, with fewer glands, and loses many of its special characteristics as it passes into the cavity of the cervix. The presence of the folds, which give to it in this situation an arborescent appearance, has already been noticed. The extent of the inner surface of the cervix is thus greatly increased, an arrangement which not only admits of free dilatation of the parts, but also furnishes a greatly increased secretory surface. It has been computed by Dr. Tyler Smith that, in a well-developed virgin uterus, the follicles of the cervix (*glandulæ Nabothi*) are not less in number than ten thousand. These glands secrete a clear tenacious fluid, which is alkaline in reaction, and which is often seen on vaginal examination to occupy the os externum, and they are liable during pregnancy to a very remarkable hypertrophy. The mucus which lubricates the parts during delivery is partly derived from this source, and in certain morbid conditions it is greatly increased in quantity, when it is either secreted of an acid reaction, or loses its alkalinity, and also its transparency, by contact with the acid mucus of the vagina. The cavity of the cervix is lined with an epithelium which in its lower half is squamous like that of the vagina. About midway between the outer and inner os, it assumes the characteristics of the ciliated and columnar epithelium of the cavity.

The uterus is supplied with blood from two sources. The *ovarian* arteries have their origin, like the spermatic in the male, from the aorta, at a point a little below the renal arteries. Passing over the psoas muscles, and occupying a fold in the peritoneum, which is indicated in fig. 24, they pass between the layers of the broad ligaments—forming what have been described as the ovario-pelvic ligaments. They follow, in their passage towards the ovary, an extremely tortuous course, which admits of free distension during pregnancy without any risk of diminution of their calibre. Giving off branches to the ovary and round ligament, they now pass inwards to join the *uterine* arteries on each side. These latter spring from the anterior division of the internal iliac, pass between the layers of the broad ligaments downwards towards the neck of the uterus, then upwards, pursuing, like the others, a very tortuous course, and, giving off numerous branches to the uterus, effect a union with the ovarian arteries. Frequent anastomoses take place, and the branches may be seen to lie in little canals or channels on the surface of the womb, before they penetrate more deeply. The veins correspond to the arteries just named, and are of considerable size. They form plexuses, which communicate freely, and during pregnancy their calibre becomes enormously increased. Within the substance of the uterus, the ramifications of the arteries retain their spiral form, but become straighter as they approach the mucous membrane, where fine branches surround the tubular glands, and ultimately form, as has been shown (fig. 31), a fine network on the free surface of the membrane. The veins which convey the returning current are, at their origin, of small size, but become much larger within the substance of the womb, attaining during pregnancy a size so considerable that they are designated the *uterine sinuses*. The cervix is less vascular than the body and fundus.

Numerous lymphatics, which are fully developed only during pregnancy, have been traced to the uterus. Some doubt still exists, however, as to the precise source of the nervous supply. All agree that the chief supply is from the sympathetic system—the hypogastric, renal, and inferior aortic plexuses being all believed to contribute. The idea generally entertained is, that the sacral nerves send some filaments to the cervix, and to the cervix only.

* Medicinische Jahrbücher des K. K. Œsterreich. Staates. Wien, 1837.

† Traité du développement de l'homme, etc., Paris, 1845.

‡ Histoire du développement des Corps Organisés. Paris, 1847.

This has been denied by Dr. Snow Beck,* and it has even been asserted by M. Jobert that no nerves whatever are sent to the vaginal portion of the cervix, but a study of the nervous supply in the case of other hollow viscera would lead us to infer, by analogy, that the idea above expressed is correct.

While, as a rule, in the Mammalia, the vagina is single, the contrary is the case as regards the womb. In the female human embryo, the uterus is formed by the median fusion of the lower parts of the ducts of Müller—which are the efferent tubes of the rudimentary generative apparatus. These meet together inferiorly, become gradually united from below upwards, and ultimately form a single cavity by the absorption of the partition between the two, so that there is a stage in development at which the human uterus is composed of two separate and distinct tubes. It follows, from the manner in which they become united, that there is a series of subsequent stages at which the partly developed organ may be termed *uterus bicollis*—when the necks are still separate; *bicorporeus*—when the union has reached the os internum; *bifundalis*—when the fundus alone is divided; and, finally, the *uterus simplex*—the highest or perfect human form. In the other Mammalia, the process is so far identical, but may be arrested at any stage to form the uterus natural to the group to which the individual belongs. In the Marsupials, not only are the two uteri separate, but also the vaginæ. In a large number of the Rodents, the vagina is single, and into its fundus two distinct uterine cavities open by separate apertures; while, in some, there is a partial division in the vagina for about a third of its length. The commencing union of the cervix is shown in some groups of the same order—as the Muridæ—where there is a very short common cavity. The confounding of the two uterine cavities may be traced in various progressive stages by an examination of the internal organs of certain of the Carnivora, the Ruminants, the Ungulata, the Edentata, and the Simiadæ; but even in women there still remains in the angles of the uterus a trace of the original bifurcation.

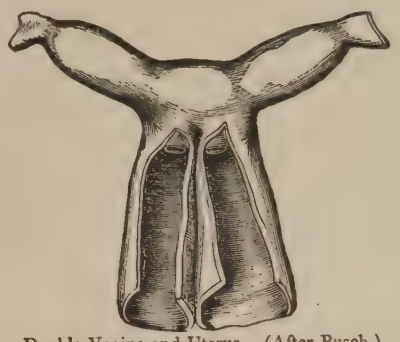
This reference to the development of these parts, and, for the analogy, to their condition in the lower animals, will be found to throw light upon certain cases of malformation or peculiarity of structure in the human subject, which apparently consist, for the most part, of a simple arrest of development. Taking the particulars above noted as a basis of classification, we may adopt the division in regard to those abnormalities which Dr. A. Farre, in his Essay on the Uterus,† has selected as the best. Of this section of his admirable monograph, the following remarks are in great part an abstract.

Group 1. Complete absence of the uterus, both of the ducts of Müller being imperfect or undeveloped. In the cases of total absence of uterus which have been recorded, it seems certain that, in a very large proportion at least, something of a rudimentary organ existed in the fold of the peritoneum lying behind the bladder, and representing the broad ligament. These rudimentary structures usually occur under the form of two hollow rounded cords, or bands of uterine tissue, extending upwards towards the ovaries. The vagina may be absent or rudimentary, as also the Fallopian tubes; but it is interesting to observe that the ovaries may be perfect in these cases—a fact easy of explanation, when we remember that the ovary is formed out of a separate portion of blastema from the Wolffian bodies and duct of Müller.

Group 2. One uterine cornu only may retain the imperfect condition last described, while the second develops, so that we now have what has been called the *uterus unicornis*. In this condition, which represents the type of the normal condition in birds, both ovaries may be found perfectly developed.

Group 3. When development progresses in both cornua, and these do not, as under ordinary circumstances, unite, various peculiarities result, which cause the uterus to assume, according to the degree of the malformation, a type which is lower or higher in the animal scale. "The marsupial type," says Owen, "is repeated in one of the rarer anomalies of the female organs in the human species." This, indeed, is an anomaly so rare and peculiar, that it has only been observed as coexistent with other malformations—such as fissure of the abdominal and pelvic walls; but what is more frequently met with is the form shown in Fig. 33, where the two uterine halves meet, and are united by a commissure of true uterine tissue, which represents the fundus uteri. The higher this commissure reaches the more does the womb approach to the normal type. In the figure there are two vaginæ, two orifices, and two uterine cavities.

Fig. 33.



Double Vagina and Uterus. (After Busch.)

In the cases shown in Fig. 34 there is but one vagina. The os also is single, as is the cavity of the cervix, the bifurcation commencing about the os internum. The angle at which the cornua unite varies in different cases—which is accounted for, as is pointed out by Rokitansky, by the height at which the uniting commissure is situated.

Group 4. In this the external form of the uterus differs but little from the normal character. The breadth of the organ is greater, especially at the fundus, where a depression in the middle line indicates the situation internally of a vertical septum, which more or less completely divides the uterine cavity into two halves,

Fig. 34.

Bifid Uterus.

and constitutes the *uterus bilocularis*. The extent of this septum may vary from a mere ridge to a complete partition, which may even invade the vagina.

These several deviations from the normal form of the uterus will influence more or less the function of the organ. Menstruation may, it is true, in a large proportion of cases, be scarcely affected; and this function will be normally discharged whenever the ovaries are perfect and an adequate channel exists. In those rarer cases, however, in which the uterus is rudimentary, there may be perfect ovaries, and atresia either of the cervix or of the vagina, with the result, if a uterine cavity exists, of an accumulation of the discharge, and attendant symptoms of considerable severity. If, on the contrary, there be no cavity, the menstrual molimen may then be relieved by the occurrence of vicarious discharges. As regards the influence exercised by such anomalies upon impregnation, much will depend upon the condition of the vagina, and also of the Fallopian tube, for, if either of them are closed, impregnation is of course impossible. If, however, they are open, it is quite possible for impregnation to occur even in a uterus unicornis.‡

* Philosophical Transactions, London, 1846. Part II., p. 219.

† "Cyclopædia of Anatomy and Physiology." London, 1859.

‡ See a remarkable case by Rokitansky, the preparation of which is in the Vienna Museum. (Pathological Anatomy—Syd. Soc., vol. ii., p. 277.)

Great difficulty and danger may arise, in such cases, during the progress of gestation. In the case, for example, which is referred to in the foot-note, death took place from rupture of the sac in the third month, the termination being thus very much what one would expect in a case in which the development of the ovum goes on in the Fallopian tube, instead of in the cavity of the womb. In the cases of the uterus bicornis and bilocularis, either side of the uterus may become separately or alternately the seat of gestation, or twins may be simultaneously developed, one on each side. There is, indeed, no good anatomical ground for absolutely rejecting the doctrine of superfœtation as a possibility in such cases. When there is a double vagina, coition usually takes place by one canal, so that successive pregnancies may be looked for on the same side. The effects produced on the act of parturition by such anomalies as have been cited have probably been exaggerated. Rokitansky has indeed shown that the axis of expulsion may, as in the one-horned variety, be so directed as to place the forces at an obvious disadvantage; but it may be assumed that, if the anomaly has been of such a grade as to admit of complete intra-uterine development, there will not likely be any impediment during delivery, which may not be surmounted by the application of ordinary principles.

Cases in which the arrest of development has taken place after birth are to be placed in a special category. At the ordinary period of puberty, the signs which indicate sexual maturity do not appear, while the uterus is found still to present the characters peculiar to infancy or childhood. In these cases, which are almost certainly productive of sterile marriages, there is often an absence of the vaginal portion of the cervix; and the other infantine conditions of the womb may be exhibited in every particular, such as the exaggeration of the forward curve which, in a smaller degree, we have indicated as the normal adult condition, the persistence, within the cavity, of rugæ similar to those of the cervix, and the thinness of the parieties.

The Ovaries.—Projecting on either side from the posterior surface of the broad ligament, and invested with a special fold of its posterior layer, are the important organs within which is elaborated that which the woman contributes to the propagation of her species, analogous therefore in this, as in other respects, to the testicles of the male. They are connected (see figs. 24, 25, and 26) with the uterus by a special ligament already described, and also through the Fallopian tubes, to one of the fimbriæ of which they are permanently adherent. In shape the ovary is a flattened oval. It varies greatly in size, according to age, and in different individuals of a similar age; but it may be set down as, on an average, about eighty grains in weight, and an inch and a half in extreme length. From the manner in which it is embraced by the peritoneum, it is free on two sides, and on the posterior border, and is attached to the broad ligament by a kind of mesentery along the anterior border only, where, between the layers, the vessels and nerves enter. The nature of the relation subsisting between the ovary and the peritoneum has of late been a subject of much interest to physiologists, and the observations of Waldeyer* certainly now leave no room for doubt that anatomists have been in error in describing the ovary as invested by the peritoneum in the same manner as the other viscera. The structure of the peritoneum proper ceases abruptly at a fold near the hilus, quite visible to the naked eye. This fold surrounds the ovary in such a way that the greater portion of its free surface consists not of the peritoneum, but of a special layer, continuous with the peritoneum, presenting, on microscopic examination, a prismatic epithelium instead of the laminated form which exists in the serous membranes. This prismatic epithelium is intimately connected with the origin of the ova. The ovary attains its greatest size after puberty, and is, up to this period, smooth on the surface. During pregnancy the position of the organ is completely changed; but, in the unimpregnated condition, it will be found lying deeply in the lateral posterior part of the pelvic cavity, covered by the small intestines, and to some extent by the Fallopian tube of the same side. Beneath the outer covering, a dense layer of the stroma, somewhat white in color from a sparseness of blood-vessels, binds the proper structure of the organ together, giving support and protection to it, and to the important structures which it contains: this is the *tunica albuginea*. The bulk of the organ beneath this is composed of highly vascular tissue of a pinkish color, which is called the *stroma* of the ovary. The stroma is composed of a dense fibro-nuclear tissue, through which blood-vessels ramify from the base of the ovary towards its surface.

The Graafian Vesicles.—If a longitudinal section is made through a mature and healthy ovary, these vesicles are brought into view, imbedded in the stroma and varying considerably in size. In number and in situation, they differ greatly according to age. In infants and young children, the ovary is found to be composed, within the tunica albuginea, of two distinct portions—one internal, corresponding to the stroma in the mature organ, and the other external, of considerable thickness and density. It is in the latter, or peripheral portion alone, that, at this time, the Graafian vesicles are to be found, in enormous numbers, but as yet of small size and in a rudimentary condition. Each is, as a rule, occupied by one young ovum, and it has been computed by Foulis* that at birth the human ovary contains not less than 35,000 ova. As puberty approaches, the distinction between the peripheral and central portion of the stroma becomes gradually less marked. Some of the vesicles enlarge, and, according to Schrön, retreat in the first instance towards the centre of the ovary. When puberty is attained, a certain number of them enlarge still further, and those which have attained the greatest size approach the surface. A few of them are from $\frac{1}{20}$th to $\frac{1}{8}$th of an inch in diameter, or even more; but the great majority remain much smaller. Their number is also greatly diminished as compared with those existing in the ovaries of children, so that we may assume that a large proportion is absorbed. The ova, which are contained within these Graafian vesicles, occupy in the case of the more developed vesicles a small space only, the rest of the vesicle being filled with fluid. Before puberty, the ovaries are smooth on the surface, but they subsequently become scarred, wrinkled, and furrowed, in consequence of the share which they take—as we shall see immediately—in the phenomena of ovulation.

The Graafian vesicle is usually described as consisting of two coats and a granular epithelial layer, three special coverings in all; but, in point of fact, there does not appear to be any distinct membrane lining the Graafian vesicle. This, indeed, is merely ovarian stroma in its finest form; while, as regards the *vascular* layer usually described, its existence is more than doubtful, although, in its developed state, a network of blood-vessels runs near the surface of the vesicle.

Fig. 35.

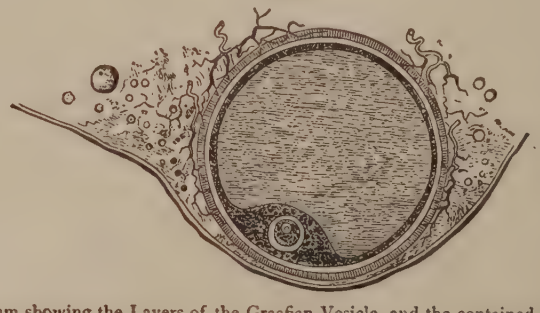


Diagram showing the Layers of the Graafian Vesicle, and the contained Ovum.

The *Ovum*, in the mature condition of the Graafian vesicle, lies near its surface, and is embedded in the *membrana granulosa;* a layer of peculiar nucleated and granular cells, which surrounds the whole of the interior of the vesicle, and is thickened at that part

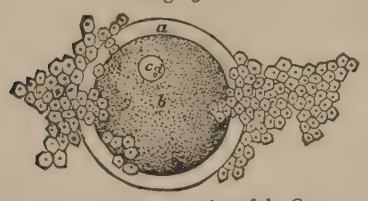
* Eierstock und Ei. Leipzig, 1870.

* Transactions of the Royal Society of Edinburgh, 1875.

where the ovum is imbedded in it (*proligerous disc* of V. Baer). This is shown in the accompanying diagram, fig. 35.

If the surface of the ovary be punctured, while a mature Graafian vesicle is projecting, and the contents of the latter pressed out, a small spherical body may be observed, if care be taken, covered with granular matter in greater or less quantity. It is more opaque than the medium in which it is suspended, and is composed of the following parts:

Fig. 36.



Diagrammatic representation of the Ovum, as it escapes from the Graafian Vesicle.

a. A thick transparent envelope, which was called by Baer, the distinguished discoverer of the ovum in the Mammalia, the *Zona pellucida.* This is identical with the *vitelline membrane*, or *membrane of the yolk* in birds. It completely surrounds the ovum, and is to all appearance impervious. It presents at least no distinct aperture or micropyle such as is observed in some animals, and has been by some supposed to exist in the human ovum.

b. The *Yolk.*—The cavity enclosed by the zona pellucida is filled with a semifluid protoplasmic mass, which is viscid and faintly granular, and which readily escapes when the sac is ruptured. It can scarcely be described as a fluid, as it retains its spherical form after rupture of the sac, and may, according to Bischoff, be broken into segments. It has no investing membrane other than the zona pellucida.

c. The *Germinal Vesicle.*—In the middle of the yolk, in the earliest stage, and in contact, in adults, with some part of the periphery of the investing membrane, a little vesicle is found, apparently quite transparent and colorless, when seen in the more opaque medium in which it is suspended. This is the germinal vesicle—first described in the ova of birds by Purkinje, and discovered in the Mammalian ovum by Coste and by Wharton Jones. It is slightly oval, and surrounded by a very thin membrane. A more careful examination of it when removed from the yolk shows that it is not absolutely transparent, but contains a few scattered granules, and, in addition:

d. The *Germinal Spot* of Wagner, which may be seen close to some point or other of the inner surface of the wall of the germinal vesicle. It is probably formed by the aggregation of cells and granules which give to it a greater opacity than characterizes the contents of the vesicle.

Although it is generally understood that the ovum is to be found on the side of the vesicle next the surface of the ovary (fig. 35), recent investigations have shown very clearly that this is by no means universal, and would almost seem to point to the conclusion that the contrary is the rule, and that, in the majority of Graafian vesicles, we are more likely to discover it on the side which lies towards the centre of the organ.

The ova begin to be formed at a very early period, and are already to be found in great numbers in the superficial layer of the rudimentary stroma of the human ovary as early as the fourth month of intra-uterine life. But their first origin is even at an earlier period. The germinal vesicle is the part of the ovum first observed, and it appears to be formed by involution from the superficial layer of germinal cells. One or more of these cells, becoming larger than the rest, sink into the stroma and soon become surrounded by a single layer of nucleated cells. This constitutes the commencement of the membrana granulosa, and represents therefore the Graafian vesicle. As development proceeds, a small quantity of protoplasmic yolk surrounds the germinal vesicle, and the cells of the membrana granulosa increase in number and assume more of the appearance of a cellular lining. The cells accumulate round the simple ovum so as to form the proligerous disk, and a space begins to be apparent between this and the rest of the membrana granulosa, within which the fluid of the vesicle afterwards accumulates. The ovum grows by the increase of the yolk round the germinal vesicle, the protoplasm becoming granular, and, finally, the yolk and germinal vesicle are enclosed by the external firm vesicular membrane, known as the zona pellucida.

These, then, are the parts of which the mature ovum, prior to impregnation, consists. On the approach of puberty, as has been seen, several Graafian vesicles, each containing an ovum, approach the surface of the ovary. As they increase in size, they form little projections beneath the investing membrane. In those animals where several ova are simultaneously fecundated—as in the sow (fig. 37)—there may be observed on the surface of the ovary a number of little cystic growths; but, in the human species, where the fecundation of more than one ovum at a time is exceptional, the Graafian vesicles, as a rule, come to maturity one by one.

Fig. 37.

Development of Graafian Vesicles in the Sow.

The changes which take place during maturation and discharge of the ova, and which are associated with the "rut" in many of the lower Mammalia, and with menstruation in women, constitute the phenomena of *Ovulation.*. These changes are manifested, not only in the Graafian vesicle, but also in all the component parts of the internal generative system.

It has already been observed that the development of the Graafian vesicle is due, in a great measure, to the increase in its fluid contents. While this is taking place, the vascularity is notably increased, not only in the vesicle itself, but in the contiguous portion of the ovary, and, in some degree, throughout the whole of the organ. The walls of the follicles become thickened, except at the part where rupture is about to take place, and a certain amount of blood is said to be effused into the cavity. This has frequently been observed (although even that has been disputed) in the sac of ruptured follicles; but the researches of Pouchet—whose views are confirmed by Farre—seem to show that an actual sanguineous discharge takes place into the follicle at a period prior to its rupture. According to Pouchet, the effect of this discharge is, mechanically, to force the ovum towards that part of the ovisac which is next the surface—it being, before this, generally found on the deep or distal side.

An increased vascularity is now observed, externally, over the salient portion of the vesicle, and the tissues become, about the centre of the projection, more and more thinned, until, at last, they yield—the ovum then escaping by a process analogous to dehiscence. The rupture takes place in a small spot where the blood-vessels previously are wanting. This is similar to the larger band of non-vascular tissue which exists in the ovicapsules of birds. Towards this non-vascular spot the neighboring vessels converge in considerable numbers, causing the appearance we have just referred to. Assuming the theories above mentioned to be correct, the bursting of the vesicle is due, not merely to an augmentation of its fluid contents, but to a thickening of its internal layer, which becomes at the same time irregular in outline and yellowish in color, and also to an effusion of blood, which has been termed the menstruation of the follicles.

This evolution of the ovum is accompanied by important changes in various parts besides the ovary. In so far as the uterus is concerned, these changes will come to be considered under Menstruation. At present it need only be observed that the whole of the internal genital organs become engorged. The Fallopian tube loses its pale color internally, and often becomes of a violet hue from extreme congestion. This is more marked towards the fimbriated extremity, which completely embraces that portion of the ovary where the mature vesicle is about to give way. The ovum is thus received into the Fallopian tube, but the rupture which admits of the dehiscence does not terminate the series of changes of which the ovary is the seat.

Before attempting a description of these changes, however, we must consider for a moment the conditions under which rupture

of the Graafian vesicle occurs, and the laws which determine this rupture.

The celebrated experiments of Bischoff, as detailed in his well-known work,* have supplied most of the facts upon which, even at the present day, the conclusions of physiologists on this subject are based. From these, and from the corroborative results obtained by subsequent observers, it is clear that ova may in the Mammalia, as in animals lower in the scale, be discharged from the ovary independently of sexual intercourse, or of any kind of influence from the male.† In other words, sexual contact or excitement is not, as the earlier observers, down to Barry, believed, the one essential determining cause of the discharge of ova. From experiments on rabbits, which were conducted by Coste, it seems, however, more than probable that sexual congress may precipitate a rupture which, but for the excitement, would have been delayed. The immediate cause which leads to a rupture is thus somewhat obscure, but we recognize the fact that the occurrence is intimately associated with the maturation of the ovum, of which, in women, the periodic menstrual flow is the external manifestation.

We have already seen that the internal layer of the Graafian vesicle presents a yellow color previous to its rupture, becomes wavy in outline, and is very considerably thicker. This change of color has been shown by Farre to be due to the presence of very minute oil granules, which give to the structure a yellow hue—hence the name given to the follicle during the period of decline—the *Corpus Luteum.* After rupture, a laceration, fissure, or scar, marks, on the surface of the ovary, the spot whence the ovum escaped, and a longitudinal section, made through the ovary in this situation, will generally bring the yellow body into view. At first, its distinguishing characteristics are but faintly shown; and it is this fact which caused Raciborski to assert that the corpus luteum was not found before rupture. Undoubtedly, however, the first stage of its formation is while the ovum is still within the vesicle; but it is only after rupture that the change in color becomes quite distinct—a change which Raciborski supposed to be due to an absorption of coloring matter from the blood-clot which fills the cavity. Whether it is due in part to this, or wholly to a further development of oil granules in the internal layer, as Coste supposed, the result is the yellow tint, which may be recognized from without, or, more distinctly, on section. If the laceration has produced an opening of sufficient size, the clot which occupies the cavity may escape along with the ovum; but, if not, it is retained and absorbed. The folding of the internal layer now becomes much more distinct, so that the internal surface of the vesicle resembles cerebral convolutions on a minute scale. According to Coste, this plication is due in great measure to retraction of the external coat, but this does not seem by any means clear, seeing that the convolutions become quite as distinct in those cases where the diameter of the whole vesicle is not diminished. It is much more likely that the plication is mainly due to the rapid increase in the cells of the membrane, which, being confined within a limited space, is thus necessarily thrown into folds. In every case, the cavity of the vesicle becomes rapidly encroached upon, the furrows between the convolutions become deeper, and the result is that the follicle now presents, in a section, a stellated appearance, which is more or less marked according to the stage at which the corpus luteum has arrived. The various changes above alluded to are shown in fig. 38, taken from Coste's Atlas, which represents an actual dissection, made at the Morgue, of the ovary of a young woman who had committed suicide towards the end of a menstrual period. It must here be noted, however, that the most recent observations have failed to demonstrate the layers of the Graafian vesicle which Coste has so distinctly indicated.

The ovary is partly dissected, to show the situation of the ova; and also the structure of the Graafian vesicles, and the changes which they undergo after rupture. Most of the vesicles are turgid, tending to protrude, and indicated by the network of vessels on their walls. Three of them are open.

Fig. 38.

Ovary Dissected, to show the structure of the Graafian Vesicle at various stages. (Coste.)

"1. The vesicle to the left in the figure is intended to demonstrate the following peculiarities:

g g. The granular membrane, which covers the whole internal surface of the Graafian vesicle.

A thickened portion of this—granular disk—showing:

c. The Ovum surrounded by the cells of the disk, and situated, as is usual, immediately before rupture, on the side next the peritoneum.

i i. Internal layer of the Graafian vesicle, showing a rich vascular network, not only on the flaps which are turned back, but also in the interior of the vesicle, through the granular membrane.

e e. External (vascular) layer, vascular like the former.

2. The open Graafian vesicle in the centre of the figure has broken spontaneously at the point *v*, and has allowed its ovum to escape. The nipple-shaped part of the granular membrane, in which the ovum was imbedded, has escaped along with it.

g. Layer of granular membrane, which has not been dragged out with the ovum.

i. Internal layer of the Graafian vesicle, forming numerous folds, which are the earliest of the modifications through which this layer passes in the formation of the Corpus Luteum.

e. External layer of the Graafian vesicle, retracted (*sic* Coste) on the former.

3. The third Graafian vesicle, to the right, has been artificially pierced to show how the ovum, while escaping, drags with it that portion of the granular membrane in which it is lodged.

g. Portion of the granular membrane, escaping by the opening made in the Graafian vesicle.

œ. Ovum lodged in the thickened nipple-like projection of this membrane."

Coste denies the presence, as a rule, of a blood-clot within the Graafian vesicle. He asserts that the vesicle, after rupture, becomes filled with a gelatinous matter, which is slightly tinged with the coloring matter of the blood. This he shows in fig. 39, where the ovary is divided in its whole length to exhibit the organization of the corpus luteum. The preparation was taken from a woman, the mother of several children, who died from poison a few days after menstruation. The body was exhumed and examined a week after death. No ovum was found in the uterus, nor in the Fallopian tube. An open corpus luteum, of considerable size, is here shown.

The description given, up to this point, applies to all corpora lutea, whether associated with pregnancy or not. It is therefore scarcely necessary to add that Haller was in error when he stated that "the corpus luteum is the effect of pregnancy alone." The demonstration of this error caused many hastily to assume that the

* Beweis der von der Begattung unabhängigen periodischen Reifung und Loslösung der Eier, etc., 1844.

† See Raciborski "De la ponte périodique chez la femme et les Mammifères." 1844.

corpus luteum was, under no circumstances, a sign of pregnancy, and was, in consequence, of no medico-legal value—an unfortunate mistake, which has been productive of much confusion, as there certainly are points of difference which enable us, with care, to distinguish between the two varieties.

The corpus luteum which is found when there has been no impregnation, runs something like the following course from the point at which we left it. It shrinks rapidly, the retractility of the outer coat being apparently the chief agent in its contraction. The contiguous surfaces of the convolutions become pressed together, and their free surfaces gradually approach across the cavity, so as rapidly to cause its obliteration.

Fig. 39.

Structure of the Corpus Luteum. (Coste.)

"*a*. Internal layer of the Graafian vesicle, plicated and having commenced that hypertrophy which converts it into corpus luteum.

b. Plastic semi-transparent matter, which occupies the centre of the corpus luteum, adheres intimately to the internal surface of the convolutions, and moulds itself upon them. To the right this matter is left in its place; on the left it has been detached, to show the subjacent convolutions and the impression which they leave upon it.

c. An old corpus luteum, from a preceding menstruation,—probably the one before last.

Graafian vesicles,—some intact, others open, and in various stages of development, are seen in other parts of the ovary."

The vascularity of the vesicle, and of the stroma of the ovary, becomes notably diminished, the ovisac loses its yellow color, and becomes white—all these changes occurring in about twenty-five or thirty days, so that, on the approach of another menstrual period, the cavity is reduced to a comparatively small size. At this stage, its appearance, as represented in fig. 40, *a*, is very characteristic, the rays which proceed outwards from the central cavity showing the point of junction of the convolutions. Several other vesicles are shown, of the ordinary size before enlargement. From this stage, the stellate remains of the vesicles gradually diminish in size, and retreat towards the centre of the stroma, to give place to others, until at last they are obliterated. Sometimes, they soften so rapidly, that they are completely reabsorbed before the folds of the internal layer have actually come in contact or contracted adhesions.

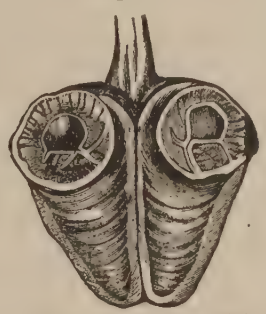
Fig. 40.

The Corpus Luteum of Simple Ovulation.

Widely different is the state of matters where the ovum has been impregnated. In this case, the functional activity of the uterus is, in a measure, shared by the ovaries, and manifests itself in an increased vascularity, which, instead of disappearing, as at the end of a menstrual period, is maintained, more or less, during the whole course of the pregnancy. It is, probably, in consequence of this that the corpus luteum of pregnancy goes through a series of transformations, so much more elaborate, and extending over a period the duration of which is so much longer. Taking the duration of an unimpregnated follicle as about two months to complete obliteration, the corpus luteum which accompanies pregnancy may be said to last usually for thirteen or fourteen months, while traces of it may be found at a still later period.

Such a history involves the idea of special structure and modified development, and this a study of the facts amply corroborates. When pregnancy succeeds or accompanies the phenomena of ovulation, the earlier changes are the same as those already described; but instead of softening and rapidly shrinking, as in the former case, the inner coat, or ovisac, continues to develop in thickness, and deepens in color, in consequence of an increase in the number of oil granules in its substance. There does not seem, in the first instance at least, to be any contraction whatever of the external membrane. On the contrary, there is some reason to believe that, at this stage, it often yields, so as to admit of an increase in the entire diameter of the vesicle, and, indeed, if we admit Coste's description to be correct, when he describes the corpus luteum of pregnancy to be "as large as the ovary itself," this can only be accounted for in the manner described. The size of the ruptured follicle varies considerably, but it often occupies, during the first four months, a fourth, a third, or a half of the entire ovary. During the period immediately succeeding impregnation, rapid hypertrophy of the inner coat goes on, and it becomes folded together into convolutions as before. The material being abundantly supplied, while the development still continues, causes the convolutions to be firmly pressed together, while their free surface encroaches upon the cavity. At the end of two months, the condensation of the hypertrophied tissue of the ovisac will be found to have imparted to the follicle a considerable amount of solidity, which is quite obvious when it is pressed by the finger. Blood-vessels run through it, from the circumference towards the centre, marking, probably, the situation of the original folds. These latter are no longer distinct, and are so compressed laterally that the layer has now the appearance of a very thick yellow coat surrounding the diminished cavity, which is up to this time, according to Montgomery, usually circular in form, as shown in fig. 41. A cavity, as here represented, is, however, exceptional.

Fig. 41.



Corpus Luteum at the Third Month of Pregnancy. (Montgomery.)

Fig. 42.

Corpus Luteum at the Sixth Month of Pregnancy. (Montgomery.)

The blood-clot which originally occupied the cavity, or, if we choose to adopt the view of Coste, the tinged lymph which is effused after rupture, undergoes certain metamorphoses, which ultimately result in the formation of a milk-white coat which lines the cavity, taking the place, as it were, of the original granular membrane. This membrane, which is also shown in fig. 41, is fibrous in structure and extremely tough. Occasionally the cavity is obliterated at the fourth month, but generally it will still be found perfectly distinct, although much reduced in size, up to the sixth month of pregnancy (fig. 42). The walls continue gradually to approach nearer to each other, the white lining membrane becomes thinner and folded into plaits, which, radiating outwards, are seen to intermingle with the yellow color of the ovisac. The outer boundary of the vesicle now becomes irregular in outline, and complete obliteration of the cavity ensues, a white stellated cicatrix in the midst of the yellow mass marking where its walls came into contact. This is shown in fig. 43, the original drawing of which was taken by Montgomery from

Fig. 43.

Corpus Luteum at the Period of Delivery.

a woman who had died of inflammation of the uterus two days after mature delivery. Up to this time, and often for some weeks afterwards, numerous vessels radiate through the corpus luteum, as may be proved by injection. This vascularity is now markedly diminished, while, at the same time, the characteristic yellow color becomes fainter in hue. It is often not till four or five months have elapsed that all trace of the corpus luteum has disappeared, a trace of the tough white membrane being then, it may be, still indicated by a very faint star-like scar in the stroma of the ovary.

As the facts above set forth are of some medico-legal, as well as obstetric, importance, they may be briefly summarized as follows:

What is called the Corpus Luteum is due to a deposit of yellow fatty matter in, and hypertrophy of, the internal layer of the Graafian vesicle (ovisac).

The formation of a corpus luteum always succeeds the rupture of a Graafian vesicle.

Up to a certain point the changes in the Graafian vesicle are uniform, and have no relation to pregnancy. The corpus luteum of pregnancy may, however, be distinguished in its subsequent course by its higher development and longer duration, its hardness, its vascularity, and, at a later stage, by the formation of the white lining membrane and large central stellate cicatrix.

The presence in the ovary of a corpus luteum is no evidence of pregnancy, unless the characteristics last indicated are distinct and unequivocal—under which circumstances it is a certain sign.

With reference to the above conclusions, it may be remarked that much confusion has arisen from the employment loosely of the terms "true" and "false," as applied to the corpus luteum, in so far as they are assumed to imply a distinction, which proves or disproves the occurrence of pregnancy. "There is as little reason," says Farre, with justifiable emphasis, "for the use of the last term as there would be for denominating a child a false man. . . . . These terms actually represent the same body, only in different stages of growth or decay."

During the whole of the child-bearing period of a woman's life, the ripening and dehiscence of the Graafian vesicles are of periodic occurrence. In those animals in which plural births are the rule, several vesicles ripen and discharge their contents at, or near, the same time; but in man this is exceptional, and we thus find that one vesicle only, as a rule, ripens at a time, bursts, discharges its contents, and rapidly shrinks as it retires towards the centre of the ovary; to give place, in a normal condition of the parts, to a constant succession of vesicles, which, one by one, run a similar course after discharging their ova. There is every reason to believe, further, that, during pregnancy and suckling, while the uterine functions are in abeyance, those also of the ovary are temporarily arrested, in so far as the development of new Graafian vesicles is concerned—the whole generative force being, as it were, turned into other channels.

The numerous lacerations which, in consequence of repeated ruptures, take place on the surface of the ovary, leave, in the process of healing, corresponding cicatrices. On this account the smoothness of surface is soon lost, and it becomes more and more fissured and wrinkled, until, towards the end of the child-bearing epoch in a woman's life, the ovary is so irregular on the surface, as to warrant the comparison which Raciborski has instituted between it and the kernel of a peach. After this, the organ becomes atrophied, and, like the uterus and other parts, is restored, in some measure, to the form which it presented in early life.

CHAPTER V.

THE ANATOMY AND PHYSIOLOGY OF THE FŒTUS.—*PLAYFAIR.*

It is obviously impossible to attempt anything like a full account of the development of the various fœtal structures, or of their growth during intra-uterine life. To do so would lead us far beyond the scope of this work, and would involve a study of complex details only suitable in a treatise on Embryology. It is of importance, however, that the practitioner should have it in his power to determine approximatively the age of the fœtus in abortions or premature labor, and for this purpose it is necessary to describe briefly the appearance of the fœtus at various stages of its growth.

1st Month.—The fœtus in the first month of gestation is a minute gelatinous and semi-transparent mass, of a grayish color, in which no definite structure can be made out, and in which no head nor extremities can be seen. It is rarely to be detected in abortions, being lost in surrounding blood-clots. In the few examples which have been carefully examined it did not measure more than a line in length. It is, however, already surrounded by the amnion, and the pedicle of the umbilical vesicle can be traced into the unclosed abdominal cavity.

2d Month.—The embryo becomes more distinctly apparent, and is curved on itself, weighing about sixty-two grains, and measuring six or eight lines in length. The head and extremities are distinctly visible—the latter in the form of rudimentary projections from the body. The eyes are to be seen as small black spots on the side of the head. The spinal column is divided into separate vertebræ. The independent circulatory system of the fœtus is now beginning to form, the heart consisting of only one ventricle and one auricle, from the former of which both the aorta and pulmonary arteries arise. On either side of the vertebral column, reaching from the heart to the pelvis, are two large glandular structures, the *corpora Wolffiania*, which consist of a series of convoluted tubes opening into an excretory duct, running along their external borders, and connected below with the common cloaca of the genito-urinary and digestive tracts. They seem to act as secreting glands, and fulfil the functions of the kidneys before these are formed. Towards the end of the second month they atrophy and disappear, and the only trace of them in the fœtus at term is to be found in the parovarium lying between the folds of the broad ligaments. At this stage of development there are met with in the human embryo, as in that of all mammals, four transverse fissures opening into the pharynx, which are analogous to the permanent branchiæ of fishes. Their vascular supply is also similar, as the aorta at this time gives off four branches on each side, each of which forms a branchial arch, and these afterwards unite to form the descending aorta. By the end of the sixth week these, as well as the transverse fissures to which they are distributed, disappear. By the end of the second month the kidneys and supra-renal capsules are forming, and the single ventricle is divided into two by the growth of the inter-ventricular septum. The umbilical cord is quite straight, and is inserted into the lower part of the abdomen.

Centres of ossification are showing themselves in the inferior maxillary bones and the clavicle.

3d Month.—The embryo weighs from 70 to 300 grains, and measures from 2½ to 3½ inches in length. The forearm is well formed and the first traces of the fingers can be made out. The head is large in proportion to the rest of the body, and the eyes are prominent. The umbilical vesicle and allantois have disappeared, the greater portion of the chorion villi have atrophied, and the placenta is distinctly formed.

4th Month.—The weight is from four to six ounces, and the length about six inches. The convolutions of the brain are beginning to develop. The sex of the child can now be ascertained on inspection. The muscles are sufficiently formed to produce distinct movements of the limbs. Ossification is extending, and can be traced in the occipital and frontal bones, and in the mastoid processes. The sexual organs are differentiated.

5th Month.—Weight about ten ounces. Length nine or ten inches. Hair is observed covering the head, which forms about one-third of the length of the whole fœtus. The nails are beginning to form, and ossification has commenced in the ischium.

6th Month.—Weight about one pound. Length eleven to twelve and one-half inches. The hair is darker. The eyelids are closed, and the membrana pupillaris exists; eyelashes have now been formed. Some fat is deposited under the skin. The testicles are still in the abdominal cavity. The clitoris is prominent. The pubic bones have begun to ossify.

7th Month.—Weight from three to four pounds. Length thirteen to fifteen inches. The skin is covered with unctuous sebaceous matter, and there is a more considerable deposit of subcutaneous fat. The eyelids are open. The testicles have descended into the scrotum.

8th Month.—Weight from four to five pounds. Length sixteen to eighteen inches, and the fœtus seems now to grow in thickness rather than in length. The nails are completely developed. The membrana pupillaris has disappeared.

Fœtus at Term.—At the completion of pregnancy the fœtus weighs on an average six and one-half pounds, and measures about twenty inches in length. These averages are, however, liable to great variation. Remarkable histories are given by many writers of fœtuses of extraordinary weight, which have been probably greatly exaggerated. Out of 3,000 children delivered under the care of Cazeaux at various charities, one only weighed ten pounds. There are, however, several carefully recorded instances of weight far exceeding this; but they are undoubtedly much more uncommon than is generally supposed. Dr. Ramsbotham mentions a fœtus weighing sixteen and one-half pounds, and Cazeaux tells of one which he delivered by turning which weighed eighteen pounds and measured two feet one and one-half inches. Such overgrown children are almost invariably stillborn. On the other hand, mature children have been born and survived which have not weighed more than five pounds.

The average size of male children at birth, as in after life, is somewhat greater than that of female. Thus Simpson* found that out of 100 cases the male children averaged ten ounces more in weight than the female, and half an inch more in length. A new-born child at term is generally covered to a greater or less extent with a greasy, unctuous material, the *vernix caseosa*, which is formed of epithelial scales and the secretion of the sebaceous glands, and which is said to be of use in labor, by lubricating the surface of the child. The head is generally covered with long dark hair, which frequently falls off or changes in color shortly after birth. Dr. Wiltshire† has called attention to an old observation, that the eyes of all new-born children are of a peculiar dark steel-gray color, and that they do not acquire their permanent tint until some time after birth. The umbilical cord is generally inserted below the centre of the body.

Anatomy of the Fœtal Head.—The most important part of the fœtus, from an obstetrical point of view, is the head, which requires a separate study, as it is the usual presenting part, and the facility of the labor depends on its accurate adaptation to the maternal passages.

The chief anatomical peculiarity of interest, in the head of the fœtus at term, is that the bones of the skull, especially of its vertex —which, in the vast majority of cases, has to pass first through the pelvis—are not firmly ossified as in adult life, but are joined loosely together by a membrane or cartilage. The result of this is that the skull is capable of being moulded and altered in form to a very considerable extent by the pressure to which it is subjected, and thus its passage through the pelvis is very greatly facilitated. This, however, is chiefly the case with the cranium proper, the bones of the face and of the base of the skull being more firmly united. By this means the delicate structures at the base of the brain are protected from pressure, while the change of form which the skull undergoes during labor implicates a portion of the skull where pressure on the cranial contents is least likely to be injurious.

The divisions between the bones of the cranium are further of obstetric importance in enabling us to detect the precise position of the head during labor, and an accurate knowledge of them is therefore essential to the obstetrician.

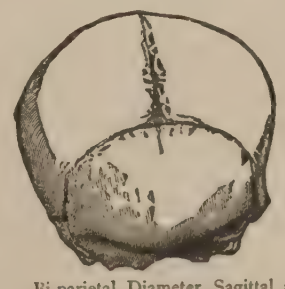
The Sutures and Fontanelles.—We talk of them as *sutures* and *fontanelles*, the former being the lines of junction between the separate bones which overlap each other to a greater or less extent during labor; the latter membranous interspaces where the sutures join each other.

The principal sutures are: 1st, the *sagittal*, which separates the two parietal bones, and extends longitudinally backwards along the *vertex* of the head. 2d. The *frontal*, which is a continuation of the sagittal, and divides the two halves of the frontal bone, at this time separate from each other. 3d. The *coronal*, which separates the frontal from the parietal bones, and extends from the squamous portion of the temporal bone across the head to a corresponding point on the opposite side; and 4th, the *lambdoidal*, which receives its name from its resemblance to the Greek letter Δ, and separates the occipital from the parietal bones on either side. The fontanelles (fig. 44) are the membranous interspaces where the sutures join—the *anterior* and larger being lozenge-shaped, and formed by the junction of the frontal, sagittal, and two halves of the coronal sutures. It will be well to note that there are, therefore, four lines of sutures running into it, and four angles, of which the anterior, formed by the frontal suture, is most elongated and well marked. The *posterior* fontanelle (fig. 45) is formed by the junction of the sagittal suture with the two legs of the lambdoidal. It is, therefore, triangular in shape, with three lines of suture entering it in three angles, and is much smaller than the anterior fontanelle, forming merely a depression into which the tip of the finger can be placed, while the latter is a hollow as big as a shilling, or even larger. As it is the posterior fontanelle which is generally lowest, and the one most commonly felt during labor, it is important for the student to familiarize himself with it, and he should lose no

Fig. 44.

Anterior and Posterior Fontanelles.

Fig. 45.



Bi-parietal Diameter, Sagittal and Lambdoidal Sutures, with Posterior Fontanelles.

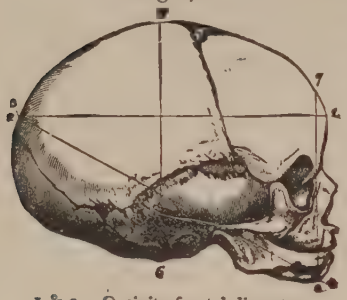
* Selected Obst. Works, p. 327.

† Lancet, February 11, 1871.

opportunity of studying the sensations imparted to the finger by the sutures and fontanelles in the head of the child after birth.

The Diameters of the Fœtal Skull.—For the purpose of understanding the mechanism of labor, we must study the measurements of the fœtal head in relation to the cavity through which it has to pass. They are taken from corresponding points opposite to each other, and are known as the diameters of the skull (fig. 46). Those of the most importance are: 1st. The *occipito-mental*, from the occipital protuberance to the point of the chin, 5.25″ to 5.50″. 2d. The *occipito-frontal*, from the occiput to the centre of the forehead, 4.50″ to 5″. 3d. The *sub-occipito-bregmatic*, from a point midway between the occipital protuberance and the margin of the foramen magnum to the centre of the anterior fontanelle, 3.25″. 4th. The *cervico-bregmatic*, from the anterior margin of the foramen magnum to the centre of the anterior fontanelle, 3.75″. 5th. *Transverse* or *bi-parietal*, between the parietal protuberances, 3.75″ to 4″. 6th. *Bi-temporal*, between the ears, 3.50″. 7th. *Fronto-mental*, from the apex of the forehead to the chin, 3.25″.

Fig. 46.



1 & 2. Occipito-frontal diameter.
3 & 4. Occipito-mental.
5 & 6. Cervico-bregmatic.
7 & 8. Fronto-mental.

Alteration of Diameter during Labor.—The length of these respective diameters, as given by different writers, differs considerably—a fact to be explained by the measurements having been taken at different times; by some just after birth, when the head was altered in shape by the moulding it had undergone; by others when this had either been slight, or after the head had recovered its normal shape. The above measurements may be taken as the average of those of the normally-shaped head, and it is to be noted that the first two are most apt to be modified during labor. The amount of compression and moulding to which the head may be subjected, without proving fatal to the fœtus, is not certainly known, but it is doubtless very considerable. Some interesting examples of the extent to which the head may be altered in shape in difficult labors have been given by Barnes,* who has shown, by tracings of the shape of the head taken immediately after delivery, that in protracted labor the occipito-mental and occipito-frontal diameters may be increased more than an inch in length, while lateral compression may diminish the bi-parietal diameter to the same length as the inter-auricular. The fœtal head is movable on the vertical column to the extent of a quarter of a circle; and it seems probable that the laxity of the ligaments admits with impunity a greater circular movement than would be possible in the adult.

Influence of Sex and Race on the Fœtal Head.—On taking the average of a large number of measurements, it is found that the heads of male children are larger and more firmly ossified than those of females, the former averaging about half an inch more in circumference. Sir James Simpson attributed great importance to this fact, and believed that it was sufficient to account for the larger proportion of still births in male than in female children, as well as for the greater difficulty of labor and the increased maternal mortality that are found to attend on male births. His well-known paper on this subject, which has given rise to much controversy, is full of the most elaborate details, and so great did he believe the fœtal influence to be, that he calculated that between the years 1834 and 1837 there were lost in Great Britain, as a consequence of the slightly larger size of the male than of the female head at birth, about 50,000 lives, including those of about 46,000 or 47,000 infants, and of between 3,000 and 4,000 mothers who died in childbed.† It is probable that race and other conditions, such as civilization and intellectual culture, have considerable influence on the size of the fœtal skull, but we are not in possession of sufficiently accurate data to justify any very positive opinion on these points.

Position of the Fœtus in Utero.—In the very large majority of cases the fœtus lies in utero with the head downwards, and is so placed as to be adapted in the most convenient way to the cavity in which it is placed. The uterine cavity is most roomy at the fundus, and narrowest at the cervix, and the greatest bulk of the fœtus is at the breech, so that the largest part of the child usually lies in the part of the uterus best adapted to contain it. The various parts of the child's body are further so placed, in regard to each other, as to take up the least possible amount of space. The body is bent so that the spine is curved with its convexity outwards, this curvature existing from the earliest period of development; the chin is flexed on the sternum; the forearms are flexed on the arms, and lie close together on the front of the chest; the legs are flexed on the thighs, and the thighs drawn up on the abdomen; the feet are drawn up towards the leg; the umbilical cord is generally placed out of reach of injurious pressure, in the space between the arms and the thighs. Variations from this attitude, however, are not uncommon, and are not, as a rule, of much consequence. Although the cranial presentations are much the most common, averaging ninety-six out of every 100 cases, other presentations are by no means rare, the next most frequent being either that of the breech, in which the long diameter of the child lies in the long diameter of the uterine cavity, or some variety of transverse presentation, in which the long diameter of the fœtus lies obliquely across the uterus, and no longer corresponds to its longitudinal axis.

Changes of the Fœtal Position during Pregnancy.—It was long believed that the head presentation was only assumed towards the end of pregnancy, when it was supposed to be produced by a sudden movement on the part of the fœtus, known as the *culbute*. It is now well known that, in the large majority of cases, the head is lowest during all the latter part of pregnancy, although changes in position are more common than is generally believed to be the case, and presentation of parts other than the head is much more frequent in premature labor than in delivery at term. In evidence of the last statement, Churchill says that in labor at the seventh month the head presents only eighty-three times out of 100 when the child is living, and that as many as fifty-three per cent. of the presentations are preternatural when the child is still-born. The frequency with which the fœtus changes its position before delivery has been made the subject of investigation by various German obstetricians, and the fact can be readily ascertained by examination. Valenta‡ found that out of nearly 1,000 cases, carefully and frequently examined by him, in 57.6 per cent. the presentation underwent no change in the latter months of pregnancy, but in the remaining 42.4 per cent. a change could be readily detected. These alterations were found to be most frequent in multiparæ, and the tendency was for abnormal presentations to alter into normal ones. Thus it was common for transverse presentations to alter longitudinally, and but rare for breech presentations to change into head. The ease with which these changes are effected no doubt depends, in a considerable degree, on the laxity of the uterine parietes, and on the greater quantity of amniotic fluid, by both of which the free mobility of the fœtus is favored.

Detection of Fœtal Position by Abdominal Palpation.—The facility with which the position of the fœtus in utero can be ascertained by abdominal palpation has not been generally appreciated in obstetric works, and yet, by a little practice, it is easy to make it out. Much information of importance can be gained in this way, and it is quite possible, under favorable circumstances, to alter abnormal presentations before labor has begun. For the purpose of making this examination, the patient should lie at the edge of the bed, with her shoulders slightly raised, and the abdomen uncovered. The first observation to make is to see if the longitudinal axis of the uterine tumor corresponds with that of the mother's ab-

* Obst. Trans., vol. vii.

† Selected Obstet. Works, p. 363.

‡ Mon. f. Geburt., 1866.

domen; if it does, the presentation must be either a head or a breech. By spreading the hands over the uterus (fig. 47) a greater sense of resistance can be felt, in most cases, on one side than on the other, corresponding to the back of the child. By striking the tips of the fingers suddenly inwards at the fundus, the hard breech

Fig. 47.

Mode of Ascertaining the Position of the Fœtus by Palpation.

can generally be made out, or the head, still more easily, if the breech be downwards. When the uterine walls are unusually lax, it is often possible to feel the limbs of the child. These observations can be generally corroborated by auscultation, for in head presentations the fœtal heart can usually be heard below the umbilicus, and in breech cases above it. Transverse presentations can even more easily be made out by abdominal palpation. Here the long axis of the uterine tumor does not correspond with the long axis of the mother's abdomen, but lies obliquely across it. By palpation the rounded mass of the head can be easily felt in one of the mother's flanks, and the breech in the other, while the fœtal heart is heard pulsating nearer to the side at which the head is detected.

Explanation of the Position of the Fœtus in Utero.—The reason why the head presents so frequently has been made the subject of much discussion. The oldest theory was, that the head lay over the os uteri as the result of gravitation, and the influence of gravity, although contested by many obstetricians, prominent among whom were Dubois and Simpson, has been insisted upon as the chief cause by others, Dr. Duncan being one of the most strenuous advocates of this view. The objections urged against the gravitation theory were drawn partly from the result of experiments, and partly from the frequency with which abnormal presentations occurred in premature labors, when the action of gravity could not be supposed to be suspended. The experiments made by Dubois went to show that when a fœtus was suspended in water gravitation caused the shoulders, and not the head, to fall lowest. He, therefore, advanced the hypothesis that the position of the fœtus was due to instinctive movements, which it made to adapt itself to the most comfortable position in which it could lie. It need only be remarked that there is not the slightest evidence of the fœtus possessing any such power. Simpson proposed a theory which was much more plausible. He assumed that the fœtal position was due to reflex movements produced by physicial irritations to which the cutaneous surface of the fœtus is subjected from changes of the mother's position, uterine contractions, and the like. The absence of these movements, in the case of the death of the fœtus, would readily explain the frequency of mal-presentation under such circumstances. The obvious objection to this theory, complete as it seems to be, is the absence of any proof that such constant extensive reflex movements really do occur in utero. Dr. Duncan has very conclusively disposed of the principal objections which have been raised against the influence of gravitation, and when an obvious explanation of so simple a kind exists it seems useless to seek further for another. He has shown that Dubois' experiments did not accurately represent the state of the fœtus in utero, and that during the greater part of the day, when the woman is upright, or lying on her back, the fœtus lies obliquely to the horizon at an

Fig. 48.

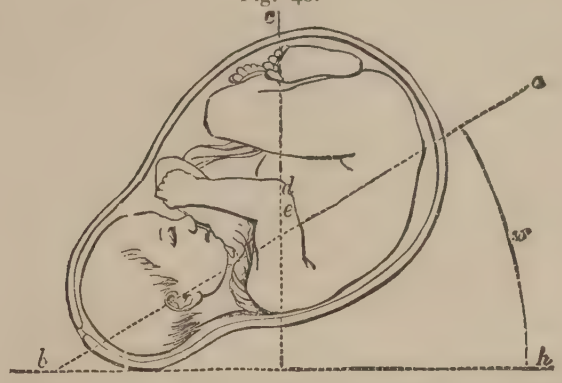
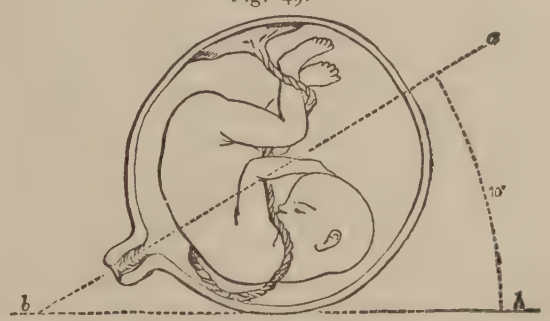


Diagram illustrating the Effect of Gravity on the Fœtus. (After Duncan.)

a, *b*, is parallel to the axis of the pregnant uterus and pelvic brim. *c*, *d*, *e*, is a perpendicular line. *e*, the centre of gravity of the fœtus. *d*, the centre of flotation.

angle of about 30°. The child thus lies, in the former case, on an inclined plane, formed by the anterior uterine wall and by the abdominal parietes, in the latter by the posterior uterine wall and the vertebral column. Down the inclined plane so formed the force of gravity causes the fœtus to slide, and it is only when the woman lies on her side that the fœtus is placed horizontally, and is not subjected in the same degree to the action of gravity (fig. 48). The frequency of mal-presentations in premature labors is explained by Dr. Duncan partly by the fact that the death of the child (which so frequently precedes such cases) alters its centre of gravity, and partly by the greater mobility of the child and the greater relative amount of liquor amnii (fig. 49). The influence of gravitation is probably greatly assisted by the contractions of the

Fig. 49.



Illustrating the Greater Mobility of the Fœtus and the Larger relative Amount of Liquor Amnii in Early Pregnancy. (After Duncan.)

a, *b*. Axis of pregnant uterus. *b*, *h*. A horizontal line.

uterus which are going on during the greater part of pregnancy. The influence of these was pointed out by Dr. Tyler Smith, who distinctly showed that the contractions of the uterus preceding delivery exerted a moulding or adapting influence on the fœtus, and prevented undue alterations of its position. Dr. Hicks proved * that these uterine contractions are of constant occurrence from the earliest period of pregnancy, and there can be little doubt that they must have an important influence on the body contained within the uterus.

Functions of the Fœtus.—The functions of the fœtus are in the main the same, with differences depending on the situation in which it is placed, as those of the separate being. It breathes, it is nourished, it forms secretions and its nervous system acts. The mode in which some of these functions are carried on in intra-uterine life requires separate consideration.

* Obst. Trans., vol. xiii., p. 216.

1. *Nutrition.*—During the early period of pregnancy, and before the formation of the umbilical vesicle and the allantois, it is certain that nutritive material must be supplied to the ovum by endosmosis through its external envelope. The precise source, however, from which this is obtained is not positively known. By some it is believed to be derived from the granulations of the discus proligerus which surround it as it escapes from the Graafian follicle, and subsequently from the layer of albuminous matter which surrounds the ovum before it reaches the uterus; while others think it probable that it may come from a special liquid secreted by the interior of the Fallopian tube as the ovum passes along it. As soon as the ovum has reached the uterus, there is every reason to believe that the umbilical vesicle is the chief source of nourishment to the embryo, through the channel of the omphalo-mesenteric vessels, which convey matters absorbed from the interior of the vesicle to the intestinal canal of the fœtus. At this time the exterior of the ovum is covered by the numerous fine villosities of the primitive chorion, which are imbedded in the mucous membrane of the uterus, and it is thought that they may absorb materials from the maternal system, which may be either directly absorbed by the embryo, or which may serve the purpose of replacing the nutritive matter which has been removed from the umbilical vesicle by the omphalo-mesenteric vessels. This point it is, of course, impossible to decide. Joulin, however, thinks that these villi probably have no direct influence on the nourishment of the fœtus, which is at this time solely effected by the umbilical vesicle, but that they absorb fluid from the maternal system, which passes through the amnion and forms the liquor amnii. As soon as the allantois is developed, vascular communication between the fœtus and the maternal structures is established, and the temporary function of the umbilical vesicle is over; that structure, therefore, rapidly atrophies and disappears, and the nutrition of the fœtus is now solely carried on by means of the chorion villi, lined as they now are by the vascular endo-chorion, and chiefly by those which go to form the substance of the placenta.

This statement is opposed to the views of many physiologists, who believe that a certain amount of nutritive material is conveyed to the fœtus through the channel of the liquor amnii, itself derived from the maternal system, which is supposed either to be absorbed through the cutaneous surface of the fœtus, or carried to the intestinal canal by deglutition. The reasons for assigning to the liquor amnii a nutritive function are, however, so slight that it is difficult to believe that it has any appreciable action in this way. They are based on some questionable observations, such as those of Weydlich, who kept a calf alive for fifteen days by feeding it solely on liquor amnii, and the experiments of Burdach, who found the cutaneous lymphatics engorged in a fœtus removed from the amniotic cavity, while those of the intestine were empty. The deglutition of the liquor amnii for the purposes of nutrition has been assumed from its occasional detection in the stomach of the fœtus, the presence of which may, however, be readily explained by spasmodic efforts at respiration, which the fœtus undoubtedly often makes before birth, especially when the placental circulation is in any way interfered with, and during which a certain quantity of fluid would necessarily be swallowed. The quantity of nutritive material, moreover, in the liquor amnii is so small—not more than six to nine parts of albumen in 1,000—that it is impossible to conceive how it could have any appreciable influence in nutrition, even if its absorption, either by the skin or stomach, were susceptible of proof.

That the nutrition of the fœtus is effected through the placenta is proved by the common observation that whenever the placental circulation is arrested, as by disease of its structure, the fœtus atrophies and dies. The precise mode, however, in which nutritive materials are absorbed from the maternal blood is still a matter of doubt, and must remain so until the mooted points as to the minute anatomy of the placenta are settled.

2. *Respiration.*—One of the chief functions of the placenta, besides that of nutrition, is the supply of oxygenated blood to the fœtus. That this is essential to the vitality of the fœtus, and that the placenta is the site of oxygenation, are shown by the facts that whenever the placenta is separated, or the access of fœtal blood to it arrested by compression of the cord, instinctive attempts at inspiration are made, and if aërial respiration cannot be performed, the fœtus is expelled asphyxiated. Like the other functions of the fœtus during intra-uterine life, that of respiration has been made the subject of numerous more or less ingenious hypotheses. Thus many have believed that the fœtus absorbed gaseous material from the liquor amnii, which served the purpose of oxygenating its blood, St. Hilaire thinking that this was effected by minute openings in its skin, Beclard and others through the bronchi, to which they believed the liquor amnii gained access. Independently of the entire want of evidence of the absorption of gaseous materials by these channels, the theory is disproved by the fact that the liquor amnii contains no air which is capable of respiration. Serres attributed a similar function to some of the chorion villi, which he believed penetrated the utricular glands of the decidua reflexa, and absorbed gas from the hydroperione, or fluid situated between it and the decidua vera, and in this manner he thought the fœtal blood was oxygenated until the fifth month of intra-uterine life, when the placenta was fully formed. This hypothesis, however, rests on no accurate foundation, for it is certain that the chorion villi do not penetrate the utricular glands in the manner assumed; or, even if they did, the mode in which the oxygen thus absorbed by the chorion villi reaches the fœtus, which is separated from them by the amnion and its contents, would still remain unexplained.

The mode in which the oxygenation of the fœtal blood is effected before the formation of the placenta remains, therefore, as yet unknown. After the development of that organ, however, it is less difficult to understand, for the fœtal blood is everywhere brought into such close contact with the maternal, in the numerous minute ramifications of the umbilical vessels, that the interchange of gases can readily be effected. The activity of respiration is doubtless much less than in extra-uterine life, for the waste of tissue in the fœtus is necessarily comparatively small, from the fact of its being suspended in a fluid medium of its own temperature, and from the absence of the processes of digestion and of respiratory movements. The quantity of carbonic acid formed would, therefore, be much less than after birth, and there would be a correspondingly small call for oxygenation of venous circulation.

3. *Circulation.*—The functions of the lungs being in abeyance, it is necessary that all the fœtal blood should be carried to the placenta to receive oxygen and nutritive materials. To understand the mode in which this is effected, we must bear in mind certain peculiarities in the circulatory system which disappear after birth.

1. The two sides of the fœtal heart are not separate, as in the adult. The right ventricle in the adult sends also the venous blood to the lungs, through the pulmonary arteries, to be aërated by contact with the atmosphere. In the fœtus, however, only sufficient blood is passed through the pulmonary arteries to insure their being pervious and ready to carry blood to the lungs immediately after birth.

An aperture of communication, the *foramen ovale*, exists between the two auricles, which is arranged so as to permit the blood reaching the right auricle to pass freely into the left, but not *vice versa*. By this means a large portion of the blood reaching the heart through the venæ cavæ, instead of passing, as in the adult, into the right ventricle, is directed into the left auricle.

2. Even with this arrangement, however, a larger portion of blood would pass into the pulmonary arteries than is required for transmission to the lungs, and a further provision is made to prevent its going to them by means of a fœtal vessel, the *ductus arteriosus*, which arises from the point of bifurcation of the pulmonary arteries, and opens into the arch of the aorta. In consequence of this arrangement only a very small portion of the blood reaches the lungs at all.

3. The fœtal hypogastric arteries are continued into two large

arterial trunks, which, passing into the cord, form the *umbilical arteries*, and carry the impure fœtal blood into the placenta.

4. The purified blood is collected into the single *umbilical vein*, through which it is carried to the under surface of the liver, from which point it is conducted, by means of another special fœtal vessel, the *ductus venosus*, into the ascending vena cava, and the right auricle.

Course of the Fœtal Circulation.—In order to understand the course of the fœtal blood, it may be most conveniently traced from the point where it reaches the under surface of the liver through the umbilical vein. Part of it is distributed to the liver itself, but the greater quantity is carried directly into the vena cava, through the ductus venosus. The vena cava also receives the blood from the fœtal veins of the lower extremities, and that portion of the blood of the umbilical vein which has passed through the liver. This mixed blood is carried up to the right auricle, from which by far the greater part of it is immediately directed into the left auricle, through the foramen ovale. From thence it passes into the left ventricle, which sends the greater part of it into the head and upper extremities through the aorta, a comparatively small quantity being transmitted to the inferior extremities. The blood which is thus sent to the upper part of the body is collected into the vena cava superior, by which it is thrown into the right auricle. Here the mass of it is probably directed into the right ventricle, which expels it into the pulmonary arteries, and from thence through the ductus arteriosus into the descending aorta. By this arrangement it will be seen that the descending aorta conveys to the lower part of the body the comparatively impure blood which has already circulated through the head, neck, and upper extremities. From the descending aorta a small quantity of blood is conveyed to the lower extremities, the greater part of it being carried for purification to the placenta through the umbilical arteries.

Establishment of Independent Circulation.—As soon as the child is born it generally cries loudly, and inflates its lungs, and, in consequence, the pulmonary arteries are dilated, and the greater portion of the blood of the right ventricle is at once sent to the lungs, from whence, after being arterialized, it is returned to the left auricle, through the pulmonary veins. The left auricle, therefore, receives more blood than before, the right less, and the placental circulation being arrested, no more passes through the umbilical vein. In consequence of this, the pressure of the blood in the two auricles is equalized, the mass of the blood in the right auricle no longer passes into the left (the valve of the foramen ovale being closed by the equal pressure on both sides), but directly into the right ventricle, and from thence into the pulmonary arteries, and the ductus arteriosus soon collapses and becomes impervious. The mass of blood in the descending aorta no longer finds its way into the hypogastric arteries, but passes into the lower extremities, and the adult circulation is established.

Changes after Birth.—The changes which take place in the temporary vascular arrangements of the fœtus, prior to their complete disappearance, are of some practical interest. The ductus arteriosus, as has been said, collapses, chiefly because the mass of blood is drawn to the lungs, and partly, perhaps, by its own inherent contractility. Its walls are found to be thickened, and its canal closes, first in the centre, and subsequently at its extremities, its aortic end remaining longer pervious on account of the greater pressure of blood from the left side of the heart. Practical closure occurs within a few days after birth, although Flourens states that it is not completely obliterated until eighteen months or two years have elapsed.* According to Schroeder, its walls unite without the formation of any thrombus. The foramen ovale is soon closed by its valve, which contracts adhesion with the edges of the aperture, so as effectually to occlude it. Sometimes, however, a small canal of communication between the two auricles may remain pervious for many months, or even a year and more, without, however, any admixture of blood occurring. A permanently patulous condition of this aperture, however, sometimes exists, giving rise to the disease known as cyanosis.

The umbilical arteries and veins and the ductus venosus soon also become impermeable, in consequence of concentric hypertrophy of their tissues and collapse of their walls. The closure of the former is aided by the formation of coagula in their interior. According to Robin, a longer time than is usually supposed elapses before they become completely closed, the vein remaining pervious until the twentieth or thirtieth day after delivery, the arteries for a month or six weeks. He has also described† a remarkable contraction of the umbilical vessels within their sheaths, at the point where they leave the abdominal walls, which takes place within three or four days after birth, and seems to prevent hemorrhage taking place when the cord is detached.

Function of the Liver.—The liver, from its proportionately large size, apparently plays an important part in the fœtal economy. It is not until about the fifth month of utero-gestation that it assumes its characteristic structure, and forms bile, previous to that time its texture being soft and undeveloped. According to Claude Bernard, after this period one of its most important offices is the formation of sugar, which is found in much larger amount in the fœtus than after birth. Sugar is, however, found in the fœtal structures long before the development of the liver, especially in the mucous and cutaneous tissues, and it seems probable that these, as well as the placenta itself, then fulfil the glycogenic function, afterwards chiefly performed by the liver. The bile is secreted after the fifth month of pregnancy, and passes into the intestinal canal, and is subsequently collected in the gall-bladder. By some physiologists it has been supposed that the liver, during intra-uterine life, was the chief seat of depuration of the carbonic acid contained in the venous blood of the fœtus. It is, however, more generally believed that this is accomplished solely in the placenta. The bile, mixed with the mucous secretion of the intestinal tract, forms the *meconium* which is contained in the intestines of the fœtus, and which collects in them during the whole period of intra-uterine life. It is a thick, tenacious, greenish substance, which is voided soon after birth in considerable quantity.

The Urine.—Urine is certainly formed during intra-uterine life, as is proved by the fact familiar to all accoucheurs, that the bladder is constantly emptied instantly after birth. It has generally been supposed that the fœtus voided its urine into the cavity of the amnion, and the existence of traces of urea in the liquor amnii, as well as some cases of imperforate urethra, in which the bladder was found to be enormously distended, and some congenital hydronephrosis associated with impervious ureters, have been supposed to corroborate this assumption. The question has been very fully studied by Joulin, who has collected together a large number of instances in which there was imperforate urethra without any undue distension of the bladder. He holds also that the amount of urea found in the liquor amnii is far too minute to justify the conclusion that the urine of the fœtus was habitually poured into it, although a small quantity may, he thinks, escape into it from time to time; and he, therefore, believes that the urine of the fœtus is only secreted regularly and abundantly after birth, and that during intra-uterine life its retention is not likely to give rise to any functional disturbance.‡

Function of the Nervous System.—There is no doubt that the nervous system acts to a considerable extent during intra-uterine life, and some authors have even supposed that the fœtus was endowed with the power of making instinctive or voluntary movements for the purpose of adapting itself to the form of the uterine cavity. There can be no question, however, that the movements the fœtus performs are purely reflex and automatic. That it responds to a stimulus applied to the cutaneous nerves is proved by the experiments of Tyler Smith, who laid bare the amnion in pregnant rabbits, and found that the fœtus moved its limbs when

* Acad. des Sciences, 1854.

† Acad. des Sciences, 1860.

‡ Acad. des Sciences, p. 301.

these were irritated through it. Pressure on the mother's abdomen, cold applications, and similar stimuli, will also produce energetic fœtal movements. The gray matter of the brain in the new-born child is, however, quite rudimentary in its structure, and there is no evidence of intelligent action of the nervous system until some time after birth, and *à fortiori* during pregnancy.

CHAPTER VI.

CONCEPTION AND GESTATION.—*MEADOWS.*

It will be convenient in considering this part of the reproductive function to arrange the phenomena under two heads—

First, *those connected with the development of the ovum.*

Secondly, *those connected with the development of the uterus.*

DEVELOPMENT OF THE OVUM.

Hitherto we have only considered the changes which take place in the ovum up to the time of its escape from the ruptured Graafian follicle. Before, however, this has been completely accomplished, by some strange and hitherto unexplained proceeding, the fimbriated or trumpet-shaped extremity of the Fallopian tube, which in the human subject is unable to encompass the entire ovary, has seized upon that particular portion of it whence the matured ovum is about to escape, and patiently but firmly awaits the rupture, that it may conduct to the uterus, either for future development or for extrusion, the ovum which has been emitted. We know nothing for certain of the force which impels the Fallopian tube to make this movement, nor how one particular ovary and one spot only of that is selected. Some elaborate researches made by M. Rouget have demonstrated the existence of muscular fibres in the broad ligament, the action of which, he affirmed, would approximate the tube to the ovary, and this would be further maintained by some erectile tissue present in the region of the ovary itself. There can be no doubt, I think, that this movement of the Fallopian tube is the direct result of vascular excitement, and that in fact erection of the parts is the consequence of injection, just as happens in the case of the male organ, and, being erect, the fimbriated extremity of the tube is impelled towards the ovary.

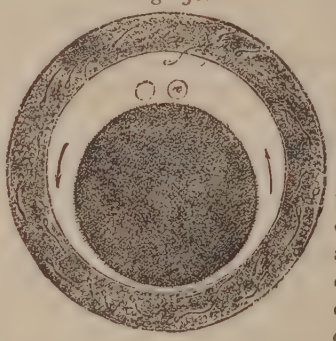
The process by which the ovum is conveyed along the Fallopian tube into the uterus is through the instrumentality of the ciliated epithelium lining the tube, which, according to Henle, vibrates only in a direction towards the uterus; this movement is further aided by the conversion of the tube into a number of minute capillary canals through the presence of small folds on its surface. It is also thought that some slight peristaltic action is exerted by the tube itself through its middle or muscular coat.

The time which is occupied in the passage of the ovum along the Fallopian tube is not known, but it is probably only a few days, and it is generally supposed that before it reaches the uterine cavity impregnation is effected by contact with the sperm cells of the male; where this takes place exactly cannot for certainty be determined; it probably varies, and is possible at any point, as the teachings of extra-uterine gestation show. But wherever this contact is effected, whether in the uterus, as some affirm, or in some part of the Fallopian tube, as others maintain, or in the ovary itself, it is quite certain that the precise nature or character of the act of impregnation is invariable; the union of the male cell (the spermatozoon) with the female cell (the ovule) must be accomplished, or there is no embryo. It is also probable that in some cases the ovum does not enter the uterine cavity for several days after fecundation.

Supposing that impregnation has been accomplished, certain changes at once occur both in the ovum and in the uterus. In the former, the investment of nucleated cells lying in close contact with the *zona pellucida*, or bounding membrane of the ovum, which adhered to it as it left the ovisac, has already to a great extent disappeared, and with it the germinal vesicle. Spermatozoa now enter with great facility its outer covering (*zona pellucida*), and shortly afterwards a space is formed between this and the yolk by the contraction of the latter. These points are all very well seen in the annexed diagram (fig. 50), after Bischoff, which represents the impregnated ovum of a rabbit. The spermatozoa are seen freely moving about within the outer covering or zona pellucida, and between it and the yolk a short space is seen. In this space one or two small granular bodies are developed, the purpose of which is not ascertained, but they are supposed to be in some way connected with the *segmentation of the yolk* which now takes place.

At first the segmentation is in two equal parts, each of these again subdivides, and so the process continues until the whole mass is broken up. It is supposed, however, that so soon as the yolk has subdivided into twelve or sixteen divisions, the ovum enters the uterine cavity, where the subsequent divisions are effected. Occasionally a gelatinous or albuminous covering is formed round the ovum before its exit from the tube. This covering is the representative of the albumen or white in the egg of the chick, and the membrane which encloses the yolk of the human ovum—here called the *umbilical* or *blastodermic vesicle*, or *germinal membrane*—corresponds with the vitellary membrane, or yolk-bag, in the egg. It is here that the first indication of the future embryo is seen, arising as an opaque round spot caused by an aggregation of cells, the *area germinativa*. Shortly afterwards, the membrane, in which this is formed, is seen to divide into two layers, which afterwards take on different characters, and fulfil widely different offices. The innermost is the *mucous* or *vegetative layer*, destined to develop the nutritive organs; the outermost the *serous* or *animal layer*, in which are formed the vertebral column and organs of animal life. It is in this layer that the embryo is first seen. Beginning as a small groove between two oval bodies, the *laminæ dorsales*, it soon dilates in three separate places, which are afterwards occupied by three portions of the encephalon; about the same time, the laminæ dorsales rise up and arch over the groove, which they enclose, and thus is formed the cerebro-spinal canal, in which are soon seen the rudimentary nervous centres. Processes are then put out on either side, the *ventral laminæ*, in which are to be developed the ribs and transverse processes of the vertebræ. These subsequently unite in front, and in this way the abdominal cavity is formed. Before these changes are accomplished, however, a clear space appears in the area germinativa, called the *area pellucida*, around which is developed the *area vasculosa*. Both layers of the germinal membrane participate in this. "The first rudiment of the intestinal canal presents itself as a channel along the under surface of the embryonic mass, formed

Fig. 50.



by the rising up of the inner layer of the germinal membrane into a ridge on either side." A tube is soon formed, which is thus, as it were, pinched off the vitelline sac; but an opening between the two still remains through the *vitelline duct*, until the abdominal walls are closed in.

Simultaneously with the occurrence of these changes is noted the first appearance of blood-vessels. These are seen in the vascular area ramifying over the membranes containing the yolk, and are soon very numerous, absorbing nutritive material from the yolk, and carrying it to the embryo. Subsequently, they are collected into two principal trunks, the *omphalo-mesenteric*, or *vitelline vessels*.

The *heart* is formed in the vascular layer beneath the upper part of the spinal column. It is the earliest among the permanent organs of the embryo which is called into functional activity. At first, it is simply cellular in structure, and resembles the permanent heart of the lower Invertebrata; but it soon becomes bent upon itself, and is divided into three cavities—an auricle, a ventricle, and a bulbus arteriosus. At this period the circulation resembles that of fishes. The last change occurs at about the third month, when the circulation assumes the form it maintains to the end of fœtal life.

Fig. 51.

Fig. 52.

At about the time when the intestinal tube is being formed, as above described, out of the yolk-bag folds of the serous layer rise up on either side the embryo; they arch over it and unite, and soon enclose it entirely. These folds are composed of a double membrane, which soon separates; the outermost layer removing away from the embryo, reaches the common envelope, and unites with it; while the inner layer remains, and forms the *amnion*. The formation of this structure, as well as the relations of the several parts of the ovum at a very early period of its existence, will be best understood by reference to the accompanying drawings, figs. 51 and 52, which are taken from Valentin's "Text-Book of Physiology." They are intended to represent imaginary vertical and longitudinal sections through the centre of the ovum, which is represented at *a*, *b*. Two double folds of the germinal membrane, *f*, *g*, rise up at either end of the embryo, *a*, *b*, forming the involucrum capitis and involucrum caudæ. The same thing occurs also on either side of and all round the ovum, so that the latter is in a short time completely enclosed within these folds. Subsequently, fluid is formed both between the layers of the membrane in question, and also between its innermost layer and the embryo. This fluid is the rudimentary liquor amnii, the cavity next the embryo is the amniotic cavity, and the innermost membrane, *f*, *g*, is the amnion. The outermost one, *k*, *k*, fig. 52, is a serous membrane, which, like the vitelline membrane, *c*, *c*, disappears in process of time, while the amnion, *f*, *g*, remains.

The umbilical vesicle, or yolk-bag, *d*, figs. 51, 52, now separates from the abdomen by a constricted portion, the umbilical duct, *e*, *e*, communication being still kept up with the intestine through the vitelline duct. Here the umbilical cord is afterwards developed. During the earlier period of embryonic life, a structure exists, which, in the case of birds, performs a very important office—viz., that of respiration; in man, however, it has but a temporary existence, and its function is at present doubtful; I refer to the *allantois*, *h*, fig. 51.

The allantois appears as an offshoot from the lower extremity of the embryo, and is probably developed from the mucous layer; it exists as a small elongated vesicle, upon which, for a time, blood-vessels, the future umbilical arteries, ramify; it gradually enlarges, as is represented at *m*, fig. 52, and comes in contact with the chorion on its outer surface, where it sends out a number of vascular villi. Ultimately its chief office is to convey vessels from the embryo to a small portion of the chorion, *n*, in which is afterwards developed *the placenta;* as soon as this has been accomplished, the function of the allantois is at an end, and it consequently disappears—the *urachus* or suspensory ligament of the bladder alone remaining in after life to show its former connection with that viscus.

A similar disappearance of the umbilical vesicle takes place, the yolk having been entirely appropriated, and the embryo being now nourished by means of the blood brought from the placenta: other structures serving merely a temporary purpose disappear, and are replaced by those of more permanent character. It is very interesting to note also, that most of these temporary formations, admirably adapted as they are for the then present condition of the embryo, are representatives of that which permanently obtains in some of the lower animals. It is so, in some respects, with regard to the earlier condition of the circulation of the human embryo, which, as I have said, resembles that of the fish. Three or four branchial (?) arches start from the two sides of the aorta, which, after ramifying over small lobules on either side of the neck, the representatives of the gills in the fish, unite again as one trunk to form the descending aorta; this arrangement, however, exists but a short time, for, during the second month, those lobules disappear, and, as I have shown before, the heart undergoes about this time a corresponding change. In the subsidence of the so-called branchial arches, the upper pair afterwards become the subclavian and carotid arteries; in the second pair, that on the right is obliterated, the other becomes the arch of the aorta; while the lowest pair form the two pulmonary arteries, that on the left side, however, joins the descending aorta as before, and thus constitutes the *ductus arteriosus* (Carpenter).

The following short account of the development of the different organs, taken chiefly from Carpenter's "Physiology," may be found useful:

The *Alimentary Canal* is formed from the vitelline sac or umbilical vesicle, with which a communication is kept up for some time. At first, it exists as a narrow straight tube, having no division of parts, and no orifices; subsequently the mouth, œsophagus, stomach, and small and large intestines are formed; and it is at the junction of the two latter that the vitelline duct exists.

The *Liver* is formed upon the small intestine, and makes its appearance first at about the third week, by the aggregation of a number of cells at the spot where the hepatic duct afterwards opens: this increases, and gradually removes further from the canal; ducts begin to appear in it, starting first of all from the intestinal wall; and so rapid is the growth, that by the fifth week the organ is about one-half the weight of the embryo itself. The subsequent changes which take place consolidate it and adapt it to what we see at birth.

The *Pancreas* and *Salivary* glands are similarly developed as offshoots of the alimentary canal. It will be remembered that all the organs of vegetative life arise from the original inner or mucous layer of the area germinativa.

The *Lungs* arise at about the sixth week, as a pair of bud-like processes from the œsophageal portion of the alimentary canal; their surfaces soon become covered with numerous little wart-like

projections, caused by corresponding enlargements of their cavity. This goes on increasing; the parenchymatous tissue is developed in the spaces between the bronchi, vessels are deposited in it, and by degrees these organs separate from the tube from which they spring, and assume more and more the natural state.

The *Urinary Organs* begin as two long tubes situate one on either side the spinal column; little cæcal appendages, the *corpora Wolffiana*, are developed on their outer sides; the ducts then enter the allantois, there being at present no proper urinary bladder; this takes place about the fifth week, and by the end of the second month they have disappeared. These take no part whatever in the development of the *Kidneys*, which begin to form at about the seventh week, behind the Wolffian bodies. At first as separate lobules, they afterwards coalesce; for some time the *Supra-renal Capsules* equal in size the kidneys, but at the sixth month the former rapidly decrease, while the latter as quickly increase in growth. The ureters at first open, with the duct of the Wolffian bodies, into the allantois; but as these bodies disappear a portion of the allantois is nipped off, and thus the *Urinary Bladder* is formed.

The *Generative Organs* are developed later than the other vegetative organs, and at first they present no essential sexual difference. This applies to both the internal and external organs, until at least as late as the fourteenth week.

The *Internal Generative Organs* appear first at the inner side of the Wolffian bodies. As development advances, the *Testes* become round, thick, vertical in direction, and are united to the *vasa deferentia;* the *Ovaries*, on the contrary, become long, flat, transversely situate, and remain unconnected with the *Fallopian tubes;* the former subsequently enter the scrotum, beginning the descent about the middle of pregnancy; the latter descend into the pelvis. The *Uterus* is formed by a coalescence of the inner extremities of the Fallopian tubes; it remains bifid or bihorned (the permanent condition of some animals) up to about the fourth month.

The developmental changes of the *External Generative Organs* are interesting, from the light it throws on some malformations incident to these parts. So early as the fifth or sixth week, a common cloaca exists for the termination of the intestine, the urinary, and generative organs. At about the tenth week, the former is separated from the two latter by a band, and subsequently these are shut off from one another by a similar band. Then the *labia majora*, or the two halves of the scrotum, as the case may be, are developed on either side the orifice of the genito-urinary canal; and above and between these a small body protrudes, being surrounded with a *glans*, and fissured on its under-surface. This becomes the *clitoris* in the female, and, by future growth, the *penis* in the male. The margins of the fissure are, in the former, developed into the *nymphæ;* in the latter, they unite and form the *urethra*. It will now be readily understood how, by arrested, or mobidly augmented development of these parts, *hermaphrodism* or other deformities may result.

Turning now to the *Organs of Animal Life*, a few words upon the development of the *Cerebro-Spinal axis* may fitly terminate the consideration of the embryological changes affecting individual organs. This, as has been already stated, takes its origin in the external, serous, or animal layer of the germinal membrane, by a contribution from each side of the primary groove, formed by the rising up of the laminæ dorsales: it is, in fact, from a portion of these latter, at first separate, but afterwards united, that the central nervous system arises. The encephalic portion consists at first of three vesicles: out of the first is formed the great portion of the *cerebral hemispheres*, the *corpora striata*, *optic thalami*, and *third ventricle;* out of the second, the *corpora quadrigemina*, and *crura cerebri;* and out of the third, the *cerebellum*, *pons Varolii*, the *medulla*, and *fourth ventricle*. At first, all these vesicles are arranged in a straight line, very much like the permanent condition of the brain in fishes, but a curve is formed about the seventh week, the hemispheres arching over the thalami and corpora quadrigemina. The *lateral sinuses* are formed about the third month, the *corpus callosum* in the fifth, and *convolutions* appear at the fourth. The *membranes* of the brain are formed at about the sixth or seventh week, the arachnoid rather later. They are developed from the primary encephalic mass.

Having now given the chief features connected with the development of the internal organs of the fœtus, it may be worth while to notice some of the more obvious external characters by which the age of a fœtus may at a given time be distinguished; only those well authenticated will be noticed, and such as the average presents. Fuller details may be seen in Devergie's "Médecine Légale."

At the end of the *first month*, the body is elongated, straight, attached at its lower extremity by a very short cord to the membranes, concave in front, convex behind; head but slightly distinguishable; no appearance of extremities; bladder and liver very large; the mouth represented by a cleft; the eyes shown very faintly by two dark spots; average length about half an inch; whole surface of chorion, villous.

During the *second month*, the body is curved; head very large, but the neck scarcely defined; face with its openings perceptible; extremities quite distinct, the upper usually appearing first near the head, and at about the fifth week; the lower near the anus; umbilical vesicle, the size of a large pea, situate close to the abdominal wall, but external to the amnion; umbilical cord distinct, and composed of omphalo-mesenteric vein and artery, two umbilical arteries and vein, the urachus, and duct leading from the umbilical vesicle to the intestine, which is said afterwards to constitute the vermiform appendage; the heart and genitals visible; average length at the end of second month about one and a half inches; chorion distinct from amnion; formation of placenta commencing.

At the end of *three months*, extremities divided into their separate parts; fingers and toes webbed; genitals quite distinct; lungs, thymus, spleen, supra-renal capsules, and kidneys distinct, the latter lobulated; cerebro-spinal axis divisible into its leading parts, and nervous structure apparent, though its consistence is very soft; ventricles of the heart separate: eyelids joined together, pupillary membrane visible; mouth and anus closed; nose and ears present; insertion of the cord removing from the pubis higher up the abdomen, this it continues to do during the rest of intra-uterine life: average length about two and a half inches. The two deciduæ are in contact; the placenta is separate; the allantois, umbilical vesicle and its vessels have disappeared.

At the end of the *fourth month*, the sexes are distinguishable; mouth and anus open; nails and gall bladder appearing; meconium present in upper bowel; cæcal valve and membrana pupillaris distinct; chorion and amnion united; average length about five and a half inches, and weight three ounces.

At the end of the *fifth month*, the skin is tolerably dense, nails and hair traceable; head, heart, and kidneys large; gall bladder formed; white matter of brain present; average length six inches; weight six ounces. At this time the movements are usually plainly felt by the mother.

At the *sixth month*, the liver is large and red; the gall bladder contains some fluid, not bitter; testes near the kidney; meconium in the large intestine; hair distinct; eyelids closed; pupillary membrane still present; skin fibrous, and covered with sebaceous matter; weight about one pound; and usually about nine inches long.

At the end of the *seventh month*, the brain presents greater firmness; eyelids open, pupillary membrane ruptured; skin much firmer and red; nails more distinct; valvulæ conniventes appearing; cæcum situate in the iliac fossa; bile present in gall bladder; kidneys consolidated, lobules disappeared; testicles descending; weight about three pounds; length thirteen inches.

At the end of *eight months*, convolutions of brain appearing; pupillary membrane gone; skin covered with sebaceous matter; nails at the end of fingers; testicles in the inguinal canal; average weight four and a half pounds; length fifteen inches.

At *full term*, the white and gray matter of the brain are distinct, convolutions well marked; nails horny, and reaching beyond the

fingers, those of the toes not quite so long; the skin is deep red, and covered with a variable quantity of sebaceous matter; hair more or less abundant; testes in the scrotum; meconium in the rectum; the umbilicus is situate just midway between the head and feet; the usual weight is from six to eight pounds; length from eighteen to twenty inches.

It may be useful here to give Dr. Delabout's ready rule for ascertaining the age of the fœtus by its length. For the first six months of intra-uterine life, the length, at different ages, is indicated in centimetres by the square of the numerical figure of the corresponding month. At the end of the first month, the fœtus measures one centimetre, equal to one-third of an inch; the second month, four centimetres; the third month, nine centimetres; and so on. At the seventh month, it measures only forty centimetres.

In the above account no mention is made of the *progress of ossification*, as it appears desirable to say a few words separately on this subject, with the view of facilitating the remembrance of its chief points. The first ossific point occurs in the clavicle, at about the sixth week; this is speedily followed by another in the lower maxilla; then successively in the vertebræ, humerus, femur, ribs, and occipital bone. At the beginning of the *third month*, ossification commences in the scapula, frontal bones, radius, ulna, tibia, fibula, and superior maxilla; by the end of the same month, it may be seen in the metatarsal, metacarpal, and phalangeal bones, together with most of the cranial bones. During the *fourth month*, the iliac bones and those of the internal ear, with the upper part of the sacrum, begin to ossify. In the *fifth month*, the ethmoid, pubis, ischium, and calcanean bones commence their ossification. The *sixth and seventh months* see the astragalus beginning. In the *eighth month*, the last bone of the sacrum, and sometimes the os hyoides; very often, however, this is not ossified even at full term. At the *ninth month*, the occipital bone still remains in four portions; the external auditory canal is ossified; the last piece of the coccyx, the patella, the carpus, the five small tarsal bones, the epiphyses of the long bones, and the sesamoid bones, are still in a cartilaginous condition.

Before quitting the consideration of the development of the ovum, the *peculiarities of the fœtal circulation* may be here explained. It may be broadly stated, that the inability on the part of the fœtus to perform the respiratory function, in consequence of its being enveloped in the liquor amnii, is the starting-point whence all the peculiarities in its circulation spring; for the lungs not being employed, they are small and collapsed, and very much resemble the liver in appearance; hence only a little blood can pass through them, since the amount is regulated by the previous condition of the air-cells. In consequence of this, the pulmonary arteries are very small, and the exit of blood from the right side of the heart would be thereby impeded but for the existence of the *foramen ovale* (*d*, fig. 53), which permits some of the blood to flow from the right to the left auricle. In spite, however, even of this safety-valve, as it may be called, there is yet more blood passing into the right ventricle than the pulmonary artery can convey away; hence another arrangement, the *ductus arteriosus* (*g*, fig. 54), a short thick trunk connecting the pulmonary artery (*e*, fig. 54) with the aorta (*f*), and allowing free escape from the ventricle. The right and left ventricles thus become one, as it were, and the blood from each enters directly into the aorta: the two auricles thus become one through the medium of the foramen ovale; the heart, therefore, and the circulation of the fœtus, at this time resemble that of a reptile.

Fig. 53.

In the pelvis, after the division of the common iliac arteries into internal and external, the latter go to supply the extremities, while the former find their way at once to the umbilicus as the *umbilical arteries*, and are destined through the cord to reach the placenta; returning from the placenta, they unite to form the umbilical vein; in this way the blood re-enters the abdomen at the umbilical orifice, it then passes upwards and along the anterior edge of the suspensory ligament of the liver, giving branches to that organ; after that, it joins directly the ascending vena cava by a short trunk, called the *ductus venosus*, or duct of Arantius, which is represented at *k* (fig. 55). This arrangement, which is for no other purpose than the purification of the fœtal blood, is also consequent upon the non-performance of the respiratory function.

The following, then, is the course taken by the blood in the fœtus; starting from the placenta it goes by the umbilical vein, carrying arterial blood along the cord into the abdomen of the child, and up to the liver, *g*, *i* (fig. 55); part goes to it, and part passes on through the ductus venosus, *k*, to the vena cava ascendens, whence it enters the right auricle, *c*; then it passes through the foramen ovale to the left auricle, and so enters the left ventricle, while

Fig. 54.

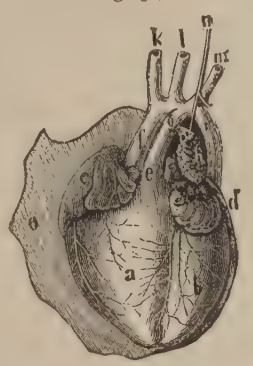
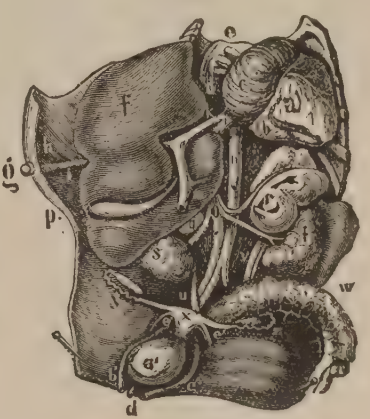
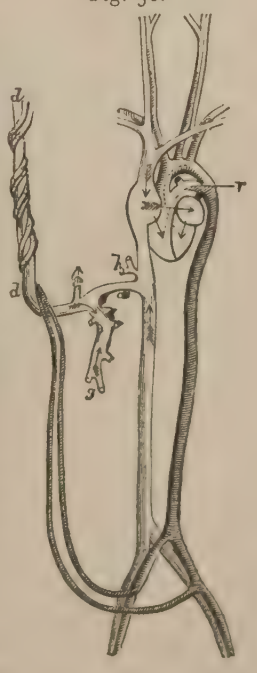


Fig. 55.



the right ventricle, *a*, is filled with the blood which the right auricle, *c*, receives from the descending cava. The two ventricles contacting, the aorta is filled directly by the left ventricle, and indirectly also by the right, through the intermediary pulmonary artery and ductus arteriosus: through the aorta, the blood passes upwards to the head and upper extremities, and downwards to the trunk and lower extremities; having arrived at the internal iliacs, the blood makes a speedy exit from the abdomen through the umbilical arteries, which are now carrying venous blood, and thus it reaches the placenta, the point from which it started. All these points are well seen in the annexed illustration, fig. 56, which represents the course of the fœtal circulation: at *d* is represented the umbilical vein bringing from the placenta to the fœtus the oxygenated blood; this divides in the abdomen of the fœtus; part goes together with that collected from the intestines, as shown at *g*, into the liver, and finally enters the vena cava at *h*, while the larger part goes direct to the vena cava through the ductus venosus, *a*, and so on to the heart by the right auricle, thence to the left auricle by the foramen ovale, and on to the left ventricle, whence it goes to the head and upper extremities. At *r* is represented the ductus arteriosus.

Fig. 56.



After birth a great change is effected in the course of the circu-

lation; consentaneous with the first inspiration, the air-cells of the lungs are opened up, the capillary surface is consequently considerably increased, a much larger quantity of blood passes into them: the ductus arteriosus is no longer required, it is stretched by the distention of the pulmonary artery; its calibre is consequently diminished, and ultimately it becomes obliterated. At the same time the right auricle throws all its blood into the right ventricle; the left auricle is filled with blood from the lungs by the four pulmonary veins, and becoming gorged, the blood closes the foramen ovale by the attempt to flow backwards into the right auricle; and hence, in a little while, the septum between the two auricles is made perfect. Moreover, the circulation being arrested through the umbilical arteries, they shrivel up from their origin at the internal iliac artery, and the same thing happens from the same cause in the case of the umbilical vein and the ductus venosus. Thus the circulation is established as it is afterwards to be maintained in adult life.

Thus far the development of the ovum alone has been considered, apart from the structures with which it is associated, and by which its connection with the mother, and consequently the preservation of its life, is maintained; these latter must now be described. And first, with regard to the *decidua;* this membrane does not strictly belong to the ovum, but is a maternal structure developed from the uterine parietes, and serves to connect the ovum with the uterus, so as to furnish it with materials for its future development. Some time before the ovum reaches the uterine cavity, and while still in the Fallopian tube, the mucous membrane of the uterus becomes swollen and congested, soft and spongy, in fact, hypertrophied; this condition is principally seen in the epithelial layer; but not only is the epithelium increased, the glands are much enlarged, the simple ones become compound, and the whole structure shows evidence of considerable hypertrophy, though no new product is thrown out.

The same phenomena occur even when the ovum does not reach the uterine cavity, as in extra-uterine gestation. To this condition of the mucous membrane the title of *decidua* is given: many different opinions have been held as to the origin of this structure; that which was most common assumed it to be an inflammatory product, much of the same nature as the exudation in croup. This was John Hunter's view; his brother William, however, regarded it as "an efflorescence of the internal coat of the uterus itself, the internal membrane of the uterus;" and subsequent observation has tended to confirm this opinion. Some observers, of whom Dr. Robert Lee is the chief, disbelieve in its uterine origin, and regard it as a distinctly ovular membrane: but against this view may be mentioned the fact that it is seen in the uterus even before the ovum enters that cavity, that it is found there also in extra-uterine pregnancy, that its vessels are derived from the uterus, and that in structure it exactly resembles the mucous membrane of the uterus: these considerations afford conclusive evidence of its real nature and origin. At first, it assumes the triangular shape of the uterine cavity, and very frequently contains three openings corresponding with the orifices of the Fallopian tubes, and cervix; these, however, are not constant.

In the early months of gestation, the decidua exists as two separate layers: an outer, called also *decidua vera*, *decidua uteri*, or *parietal decidua*, which is the best term for it; and an inner layer, the *decidua reflexa*, *decidua chorii*, or *decidua ovuli*—the latter seems the fittest appellation. In fig. 57 these structures are represented at *a*, *b*.

The *parietal layer* (*a*, fig. 57), or that immediately lining the uterine cavity, presents on its *external surface* a very shaggy appearance, the small projecting filaments being thought by some to be the utricular glands detached from the substance of the uterus. Dr. Priestley, however, believes that they are nothing more than fibro-cellular structures, which exist also in the deeper layers of the decidua; they are no doubt caused by the tearing away of the membrane from the proper tissue of the uterus. Besides these may be seen small cup-shaped eminences having minute apertures at their summit leading into little cup-like cavities; these are more properly the remains of the uterine glands. The appearance presented by the *internal surface* of this parietal layer is widely different from the above: it is quite smooth and shining, but "elevated into numerous projections, which may be roughly compared to the cerebral convolutions" (*Farre*). The entire surface is covered with minute apertures, which are found to be continuous with those already mentioned as existing on the outer surface, and are believed to be the orifices of the uterine glands; they are lined with epithelium. Thus these glands, which in the unimpregnated state are indistinguishable, except with the microscope, may be readily seen even with the naked eye in the early weeks of gestation.

If we examine the intimate structure of the decidua at about the sixth week, we find it is composed of large round and oval cells, nuclei, and fat granules, with elongated fibre cells; the whole so bound up that if we spread out a portion of the membrane, and examine it with the microscope, "it is observed to be readily separable into irregular portions or fragments, with clear interspaces —very much, in fact, like a web or network—formed by the superposition of several layers of a cribriform membrane one upon another" (Priestley's "Lectures on the Development of the Gravid Uterus").

The *inner layer*, or *decidua ovuli* (*b*, fig. 57), that which invests the ovum, is composed of almost precisely the same histological elements as the parietal layer; indeed, it is but a part of the same structure, presenting on its outer surface numerous orifices of uterine glands, and on its inner or ovular surface a number of depressions corresponding to the villi of the chorion. The chief interest which attaches to it has reference to its formation. Dr. William Hunter, who gave to it the name *reflexa*, believed that it was formed by the ovum, as it entered the uterine cavity from the Fallopian tube, thrusting it away from the uterine wall, and so developing itself, as it were, by it; just as the heart is enveloped by the pericardium. Sharpey and Coste suppose that the ovum becomes embedded in a fold of the decidua, which then grows up round it and encloses it. Farre supposes that the ovum, when it reaches the uterine cavity, "drops into one of the orifices leading to the utricular follicles, and in growing there draws around it the already formed but soft and spongy decidua constituting the walls of the cavity;" while Weber suggests that there are two layers of decidua formed, the one before the other, after the ovum leaves the Fallopian tube; that they remain connected in one-third of their extent, and that the ovum occupies the first formed, which thus becomes the so-called *reflexa* (*b*, fig. 57). That portion of the decidua where the two layers are united together is called the *decidua serotina*, so named by those who believe that the reflexa is a reflection of the parietal layer; which thus leaves the uterine surface denuded, and so necessitates this subsequent secretion. It is here that the placenta is afterwards developed.

Fig. 57.

By the formation of these membranes, the uterine cavity is obviously divided into two: the one contains the fœtus; the other is called the decidual cavity. As the former cavity expands, the latter diminishes; and at about the fifth or sixth month disappears —some say by the fusion of the two laminæ, others by the atrophy and disintegration of the ovular layer. No decidua is formed in the cervical portion of the uterus.

The following series of illustrations represent pretty accurately,

I believe, though of course in a diagrammatic way, the mode of formation of the decidua. For these diagrams I am indebted to

Fig. 58.

Fig. 59.

the admirable work of Professor Dalton on "Human Physiology." In all of them the black portion is intended to represent the decidua, and the round body the ovum; the cervix, it will be seen, takes no part in this process. At fig. 58 the ovum is seen just embedded in two folds of the swollen and hypertrophied mucous membrane, with which it soon contracts an adhesion, and now an extraordinary amount of activity takes place, by means of which the enclosing folds of mucous membrane arch up and gradually cover over the whole surface of the ovum, as is represented in figs. 59, 60. The enveloping mucous membrane forms the decidua reflexa, and it will be observed that between it and the parietal layer, or decidua vera, which lines the uterine cavity, there is now formed a separate sac, while the ovum also is enclosed in another distinct and separate cavity. After a while, union between the ovum and its containing sac takes place, and it is brought about in the following manner. Shortly after the ovum reaches the uterine cavity, and when it is being invested with the decidua reflexa, certain villosities, which have formed on its surface, begin to project into the uterine tubules or follicles. This takes place over the whole cir-

Fig. 60.

Fig. 61.

Fig. 62.

cumference of the ovum, and thus it is that the chorion is formed, for these villosities become vascular tufts, each carrying a loop of vessels which dip down as it were, like rootlets, into the vascular decidua and so imbibe their nutritive fluid. The process is represented diagrammatically in fig. 61. Later on, some of these tufts disappear, while others increase and multiply in a particular area, and become branched, and complex, and extremely vascular. The placenta is developed finally out of these vascular tufts, in the area indicated, and as represented in fig. 62.

Numerous blood-vessels pass from the uterus into the decidua; they there form capillary loops among the glandular tubules, which freely anastomose with one another.

The *Chorion* (*e*, fig. 57) is the structure lying next in order to the decidua, and is the first of the fœtal envelopes met with in dissecting an aborted ovum; internal to it is the sac of the amnion. The chorion begins to be formed in the Fallopian tube as an albuminous layer enveloping the ovum; but as soon as it reaches the uterine cavity a number of small tubular projections—the chorion villi—start from every point of its outer surface. At first these are simple straight tubes, with blind extremities, which are embedded in the substance of the decidua like rootlets, serving to keep the ovum in its place, and also to supply it with nourishment. At this time no vessels exist in it, but at about the second month the vascular sac of the allantois (*h*, fig. 51, and *m*, fig. 52) comes into contact with the inner surface of the chorion, forming its inner layer, or *endochorion*, and then capillary twigs are sent into the hollow villi: these now take on a rapid development—they become compound branching tufts, enclosing capillary vessels, which are brought into close inter-digitating communion with the capillaries ramifying in the decidual membrane; so intimate is the union in later months that it is impossible to unravel the meshes. These tufts are composed externally of a layer of cells, readily separable from the fibrous coat which makes up the bulk of the trunk, and which encloses the vessels within.

Fig. 63.

During the first three months of gestation every part of the chorion remains covered with villi, giving it the appearance, when placed in water, of a beautiful white shaggy, or woolly membrane. After this time, however, a great number of the villi begin to disappear, so that a large portion of the external surface becomes smooth, except within the site of the placenta, where they increase enormously, becoming at the same time more convoluted, and constituting the fœtal portion of that organ, their trunks uniting to form the umbilical vessels. The inner surface of the chorion is smooth, like mucous membrane; no nerves or lymphatics have been traced in it.

Immediately investing the embryo, and lying internal to the chorion, is the *Amnion*, *f*, *g*, figs. 63, 64, a thin transparent membrane, but possessed of much strength. It exists at a very early period of development, at first slightly separated from, it afterwards comes into contact with, the chorion, and is continuous with the common integument of the embryo, being reflected from it over the umbilical cord. Over the site of the placenta it becomes firmly adherent to the chorion. Its inner surface resembles a serous membrane, and serves to secrete a fluid called the *liquor amnii*, in which the embryo floats; its outer surface is rather rough, and has a reticulate appearance. During the first few months of, and sometimes even throughout gestation, when a space exists between this and the chorion, a fluid is contained therein, called the *liquor allantoidis*, or *liquor amnii spurius;* it is this which often escapes early in the commencement of labor, sometimes even days or weeks before that, and gives rise to the opinion that the membranes have ruptured.

Fig. 64.

In structure the amnion consists of a fibrous membrane, covered with a layer of oval nucleated epithelial cells, but containing neither vessels nor nerves.

The *Liquor amnii* is the fluid contained within the amniotic cavity; at full term it varies in amount from eight to sixteen ounces, and relatively to the weight of the fœtus it varies constantly throughout pregnancy. At first it weighs considerably more than the embryo; towards the middle of pregnancy it about equals it; while at full term it varies from $\frac{1}{8}$ to $\frac{1}{12}$ or less of the weight of the fœtus. This altered relation of the amount of liquor amnii to the fœtus is important in reference to the practice of puncturing the uterus in order to let off this fluid in cases of otherwise irreducible retroflexed gravid uterus; for, obviously, this fluid, at a time when it is much more in amount in proportion to the size of the fœtus, is more important in its results than at the later periods of pregnancy, when this proportion is reversed—in the former case the uterus is relatively more reduced in size than it could be in the latter case. At first the liquor amnii is clear, but it becomes slightly turbid, and is of alkaline reaction, with a specific gravity a little above that of water; it contains a small quantity of albumen and gelatine, a trace of phosphate of lime, chloride of sodium, and ammonia. Its source is still unknown; it is probably supplied by the amnion as a true secretion. Meckel thought it came from the maternal vessels.

The liquor amnii has been considered a source of nutrition to the embryo in the early weeks, as it is known then to contain more nutritious elements than at a later period, when its uses appear to be simply mechanical. "It secures the fœtus against external pressure or violence, and supports the regular distension of the uterus; on the other hand it diminishes and equalizes the pressure of the fœtus upon the uterus; during labor, by distending the membranes into an elastic cone, it materially assists to dilate the os uteri; it also serves to lubricate and moisten the external passages."

The *Placenta* is the most important of all the temporary embryonic structures, and may be said to perform the functions of both lungs and stomach to the fœtus. Great diversity of opinion has existed with regard to the anatomy and physiology of this organ, and the conflicting descriptions given in different obstetric works by no means tend to dispel the confusion which surrounds the subject.

It is not until towards the end of the second month that the placenta begins to be formed. It gradually increases in size to the end of gestation, when it forms an irregularly oval mass about eight or nine inches long, and six or seven wide, with a thickness varying from one to two and a half inches, according as the organ is empty or filled with blood. The weight has been variously estimated at from fifteen to thirty ounces.

The most frequent *situation* is at the upper and back part of the uterus, and is more often attached to the left than the right side, near to the orifice of the Fallopian tube. No reason can be assigned for this, nor is there anything like uniformity in regard to its site. According to the late Mr. Carmichael, it was much more frequently at the lower part of the uterus, generally posteriorly, but occasionally anteriorly, and, as is well known, it is sometimes situate near to, or even over the os uteri.

The placenta has *two surfaces*, a fœtal and a uterine: the former receives the insertion of the umbilical cord; it is smooth and shining, from being covered with the amnion, through which, and projecting above its surface, may be seen the chief divisions of the umbilical vessels ramifying over this surface of the placenta.

Immediately beneath the amnion and loosely connected with it lies the chorion, which enters largely into the formation of the placental mass, giving strength to it, and transmitting the branches from the subdivision of the umbilical vessels.

The substance of the placenta is made up of two distinct portions, the fœtal and the maternal. In the early months of gestation these are much more distinct and separable than subsequently; but, although they become in later months most intimately and intricately interwoven, so as to render any separation an impossibility, yet, in reality, to the very last, they maintain a perfectly independent connection.

The *fœtal portion* of the placenta receives the branches of the two umbilical arteries, which, when they first reach this surface of the organ, divide each into two; this dichotomous division takes place again and again, until the vessels are reduced to about the size of a crowquill, when they dip down into the chorion, passing through it to enter the substance of the placenta, numerous branches being everywhere given off from the main vessels to enter the organ. After splitting up to form the ultimate ramifications and fœtal villi, all the blood is again returned by sixteen veins, which join the chief branches above mentioned, following them side by side on the surface of the placenta, and ending in the one umbilical vein.

The *uterine* portion of the placenta is seen to be divided into a number of small lobules or cotyledons, of from half an inch to one and a half inches in diameter, and over all is spread a soft pulpy membrane, the *placental decidua*, or *decidua serotina*, which dips down into the sulci, much as the pia mater does in the brain; it separates the placenta from the proper tissue of the uterus, and in it are embedded the uterine vessels which pass to and from that organ. "Numerous valve-like apertures are observed upon all parts of its surface. They are the orifices of the veins which have been torn off from the uterus. A probe passed into any of these, after taking an oblique direction, enters at once into the placental substance; small arteries, about half an inch in length, are also everywhere observed embedded in this layer. After making several sharp spiral turns they likewise suddenly open into the placenta. These are the uterine vessels which convey the maternal blood to and from the interior of the placenta" (*Farre*). The placenta proper is thus seen to be enclosed between the two membranes, the amnion and the decidua serotina, which cover its fœtal and uterine surfaces; at its circumference they become united, and then spread out to enclose the liquor amnii and fœtus.

Between the two portions of the placenta, above described, are situated the *fœtal villi*; these form the important part of this organ by means of which all the nutriment bestowed by the mother on the fœtus is absorbed; they spring from the chorion and penetrate the placental decidua. Between their ramifications are certain spaces called placental cells, in which the maternal blood circulates, and here it is that the fœtal villi absorb the nutritive elements. Taking a single villus for examination at about the sixth month, it will be found to contain one or more arterial trunks, which give off a great number of smaller branches, spreading out in different directions, and giving to the whole a more or less arborescent appearance; these smaller branches break up into a minute capillary plexus, from which the blood is collected again into small veins, which pass out of the villus alongside the corresponding artery. Each villus, with its subdivisions, is enclosed in a tolerably firm sheath, and the space between the vessels and the containing sheath is filled up by a pulpy granular substance.

The condition just described does not, however, continue throughout pregnancy, for at full term, as was demonstrated by Goodsir, one vessel only enters each tuft, and forms a single loop; it then either returns or divides into one or more twigs. But in all cases, and at all periods, the tips of the villi reach the placental decidua and are imbedded in it.

On the maternal side no such arrangement as the above exists, "the maternal vessels all terminate at once and abruptly upon the inner surface of the decidua." After the vessels have left the uterine tissue, they open suddenly into the placental cells, which are spaces between the fœtal villi, and the blood is returned from these cells to the uterine sinuses by veins which begin in the cells just as the arteries open there. The placental cells are all lined by a membrane which is continuous with the vascular system of the mother, "so that when the blood of the mother flows into the placenta through the curling arteries of the uterus, it passes into a large sac formed by the inner coat of the vascular system of the mother, which is intersected in many thousands of different directions by the placental tufts projecting into it like fringes, and pushing its thin walls before them in the form of sheaths, which closely envelope both the trunk and each individual branch composing these tufts. From this sac the maternal blood is returned by the utero-placental veins, without having been extravasated, or

without having left her own system of vessels. The blood of the mother contained in the placental sac, and the blood of the fœtus contained in the umbilical vessels, can easily act and react upon each other through the spongy and cellular walls of the placental vessels and the thin sac ensheathing them, in the same manner as the blood in the branchial vessels of aquatic animals is acted upon by the water in which they float."—*Dr. John Reid.*

Fig. 65 represents very well a diagrammatic vertical section of the placenta. "At *a a* is seen the chorion, receiving the umbilical vessels from the body of the fœtus through the umbilical cord, and sending out its compound and ramified vascular tufts into the substance of the placenta. At *b b* is the attached surface of the

Fig. 65.

decidua, or uterine mucous membrane; and at *c c* are the orifices of uterine vessels which penetrate it from below. These vessels enter the placenta in an extremely oblique direction, though they are represented in the diagram, for the sake of distinctness, as nearly perpendicular. When they have once penetrated, however, the lower portion of the decidua, they immediately dilate into the placental sinuses (represented in the diagram in black), which extend through the whole thickness of the organ, closely embracing all the ramifications of the fœtal tufts."—*Dalton.* At this stage, then, the placenta is simply a mass of blood-vessels, having no other structure whatever in its composition.

It will thus be seen that *there is no direct vascular communication between the mother and the fœtus*, and hence all the eliminative changes necessary for the depuration of the fœtal blood, and the passage of all nutritive materials required for the growth and development of the fœtus, take place by endosmosis through the ends of the fœtal tufts which are being constantly bathed by maternal blood, and thus act the part of both stomach and lungs to the fœtus. The two bloods are kept apart by three structures, the capillary wall, the containing membrane of the tuft, and the lining membrane of the placental sac, which is a maternal structure.

All attempts to discover any *nervous connection between the fœtus and the mother* have hitherto entirely failed; no one has yet ventured to affirm the existence of nerve structure in the umbilical cord, nor has a trace been discovered in the placenta itself; yet if it be true, as some believe, that the mind of the mother can influence the child so as to produce all kinds of deformity, it would seem necessary to establish some sort of nervous communion. For my own part, I never could adopt the theory in question, and strangely coincident as are many of the cases which have been recorded, they have never yet presented to my mind any logical proof in support of it. It seems to me unwise to accept a theory which may bar the way to future investigation, and the acceptance of which, in my judgment, creates far greater difficulties than those it is intended to explain. Why the fœtus in utero should be more amenable to maternal fancies than any other part of her body, the nervous connections of the two being remembered, I am at a loss to conceive, and methinks it would puzzle the most impressionable mother to produce any monstrosity of her own person by mental agency; yet if this be impossible, why is not the other? One can easily understand how the child, *as a whole*, may be affected through the mother, and how peculiarities in the parent are transmitted to the offspring; these are produced in the same way as family likenesses; but it is by no means easy to understand how a *particular part* of a child can by its mother's mind become affected in a particular way; and, I repeat, that the advocates of such a theory have hitherto established nothing beyond the mere coincidence, which, strange as it is, is nevertheless no *proof.*

The *Funis*, or *Umbilical Cord*, serves to connect the fœtus with the placenta, and is the only bond of union between the mother and the child; to the latter, it is attached at the navel, and its other end is inserted into the placenta. Generally, the centre of the placenta is the point of attachment, but sometimes it is nearer the edge, and, in fact, it may be anywhere. The funis varies greatly in length at full term—its usual length is from eighteen to twenty inches; but it has been met with as long as fifty-six, and as short as five, inches. Externally, it is invested by the amnion, within which is a layer of the chorion, the substance of the cord being made up of the umbilical arteries and vein, which are embedded in a sort of gelatinous material, consisting of a very delicate cellular structure infiltrated with albuminous matter. Earlier in fœtal life, it also contains a portion of the intestinal canal, the urachus, the umbilical vesicle, and the omphalo-mesenteric vessels.

In the first three or four weeks of pregnancy there is no trace of any cord, the ovum being attached by its lower extremity to the containing envelopes: at about the fifth or sixth week of gestation, it appears as a very short thick cord, the vessels in it then running in a *straight* direction from the fœtus; this they continue to do until the end of the second month, when, with the gradual lengthening of the cord, they take a *spiral* form, which is usually from left to right. There are always two arteries and one vein, the blood from the common iliac arteries of the fœtus being carried to the placenta along the former, while that from the placenta to the fœtus is conveyed by the one umbilical vein, which accordingly equals in size the two other vessels; there are no valves in this vein.

As was before stated, no nerves have yet been detected in the umbilical cord, nor are there any blood-vessels in its structure; but some lymphatics have recently been discovered, and Virchow has made some interesting observations on the structure of the gelatinous material in which the umbilical vessels are embedded, which will be found in his "Cellular Pathology."

The cord generally floats about in the liquor amnii, sometimes it gets coiled round the neck, at other times round one or other extremity; and it has been supposed that in cases where a limb, or part of a limb, has been missing, it has been brought about by the cord being so tightly twisted round the part, that strangulation and amputation have resulted; the possibility of such a thing happening has, however, been disputed, from the idea that a degree of tightness requisite for such strangulation would necessarily prove fatal to the child by arresting the circulation in the cord.

[The editor is indebted to the courtesy of Henry C. Lea's Sons & Co. for permission to copy Figs. 58, 59, 60, 61, 62, 63, 64, 65.]

CHAPTER VII.

PREGNANCY.—*PLAYFAIR.*

As soon as conception has taken place a series of remarkable changes commence in the uterus, which progress until the termination of pregnancy, and are well worthy of careful study. They produce those marvellous modifications which effect the transformation of the small undeveloped uterus of the non-pregnant state into the large and fully-developed uterus of pregnancy, and have no parallel in the whole animal economy.

A knowledge of them is essential for the proper comprehension of the phenomena of labor, and for the diagnosis of pregnancy which the practitioner is so frequently called upon to make. Excluding the varieties of abnormal pregnancy, which will be noticed in another place, we shall here limit ourselves to a consideration of the modifications of the maternal organism which result from simple and natural gestation.

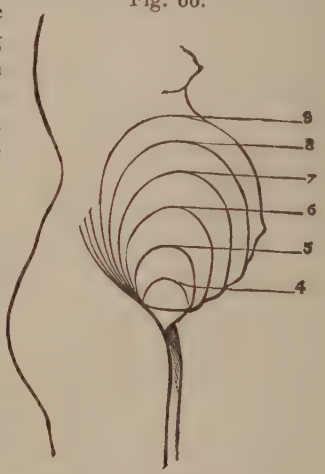
Changes in the Uterus.—The unimpregnated uterus measures two and one-half inches in length, and weighs about one ounce, while at the full term of pregnancy it has so immensely grown as to weigh twenty-four ounces, and measure twelve inches. This growth commences as soon as the ovum reaches the uterus, and continues uninterruptedly until delivery. In the early months the uterus is contained entirely in the cavity of the pelvis, and the increase of size is only apparent on vaginal examination, and that with difficulty. After the third month the enlargement is chiefly in the lateral direction, so that the whole body of the uterus assumes more of a spherical shape than in the non-pregnant state. If an opportunity of examining the gravid uterus *post-mortem* should occur at this time, it will be found to have the form of a sphere flattened somewhat posteriorly, and bulging anteriorly.

After the ascent of the organ into the abdomen, it develops more in the vertical direction, so that at term it has the form of an ovoid, with its large extremity above and its narrow end at the cervix uteri, and its longitudinal axis corresponds to the long diameter of the mother's abdomen, provided the presentation be either of the head or breech. The anterior surface is now even more distinctly projecting than before—a fact which is explained by the proximity of the posterior surface to the rigid spinal column behind, while the anterior is in relation with the lax abdominal parietes, which yield readily to pressure, and so allow of the more marked prominence of the anterior uterine wall.

Change in Situation.—Before the gravid uterus has risen out of the pelvis no appreciable increase in the size of the abdomen is perceptible. On the contrary, it is an old observation that at this early stage of pregnancy the abdomen is flatter than usual, on account of the partial descent of the uterus in the pelvic cavity as a result of its increased weight. As the growth of the organ advances it soon becomes too large to be contained any longer within the pelvis, and about the middle of the third or the beginning of the fourth month the fundus rises above the pelvic brim—not suddenly as is often erroneously thought, but slowly and gradually—when it may be felt as a smooth rounded swelling.

Size at various Periods of Pregnancy.—It is about this time that the movements of the fœtus first become appreciable to the mother, when "*quickening*" is said to have taken place. Towards the end of the fourth month the uterus reaches to about three fingers' breadth above the symphysis pubis. About the fifth month it occupies the hypogastric region, to which it imparts a marked projection, and the alteration in the figure is now distinctly perceptible to visual examination. About the sixth month it is on a level with, or a little above, the umbilicus. About the seventh month it is about two inches above the umbilicus, which is now projecting and prominent, instead of depressed, as in the non-pregnant state. During the eighth and ninth months it continues to increase until the summit of the fundus is immediately below the ensiform cartilage (fig. 66). A knowledge of the size of the uterine tumor at various periods of pregnancy, as thus indicated, is of considerable practical importance, as forming the only guide by which we can estimate the probable period of delivery in certain cases in which the usual data for calculation are absent, as, for example, when the patient has conceived during lactation.

Fig. 66.



Size of Uterus at various Periods of Pregnancy.

The Uterus Sinks before Delivery.—For about a week or more before labor the uterus generally sinks somewhat into the pelvic cavity, in consequence of the relaxation of the soft parts which precedes delivery, and the patient now feels herself smaller and lighter than before. This change is familiar to all child-bearing women, to whom it is known as "the lightening before labor."

The Direction of the Uterus.—While the uterus remains in the pelvis its longitudinal axis varies in direction, much in the same way as that of the non-pregnant uterus, sometimes being more or less vertical, at others in a state of anteversion or partial retroversion. These variations are probably dependent on the distension or emptiness of the bladder, as its state must necessarily affect the position of the movable organ poised behind it. After the uterus has risen into the abdomen its tendency is to project forwards against the abdominal wall, which forms its chief support in front. In the erect position the long axis of the uterine tumor corresponds with the axis of the pelvic brim, forming an angle of about thirty degrees with the horizon. In the semi-recumbent position, on the other hand, as Duncan* has pointed out, its direction becomes much more nearly vertical. In women who have borne many children, the abdominal parietes no longer afford an efficient support, and the uterus is displaced anteriorly, the fundus in extreme cases even hanging downwards.

Lateral Obliquity of the Uterus.—In addition to this anterior obliquity, on account of the projection of the spinal column, the

* Researches in Obstetrics, p. 10.

uterus is very generally also displaced laterally, and sometimes to a very marked degree, so that it may be felt entirely in one flank, instead of in the centre of the abdomen. In a large proportion of cases this lateral deviation is to the right side, and many hypotheses have been brought forward to explain this fact, none of them being satisfactory. Thus, it has been supposed to depend on the greater frequency with which women lie on their right side during sleep, on the greater use of the right leg during walking, on the supposed comparative shortness of the right round ligament, which drags the tumor to that side, or on the frequent distension of the rectum on the left side, which prevents the uterus being displaced in that direction. Of these the last is the cause which seems most constantly in operation, and most likely to produce the effect.

Changes in the Direction of the Cervix.—The cervix must obviously adapt itself to the situation of the body of the uterus. We find, therefore, that in the early months, when the uterus lies low in the pelvis, it is more readily within reach. After the ascent of the uterus, it is drawn up, and frequently so much so as to be reached with difficulty. When the uterus is much anteverted, as is so often the case, the os is displaced backwards, so that it cannot be felt at all by the examining finger.

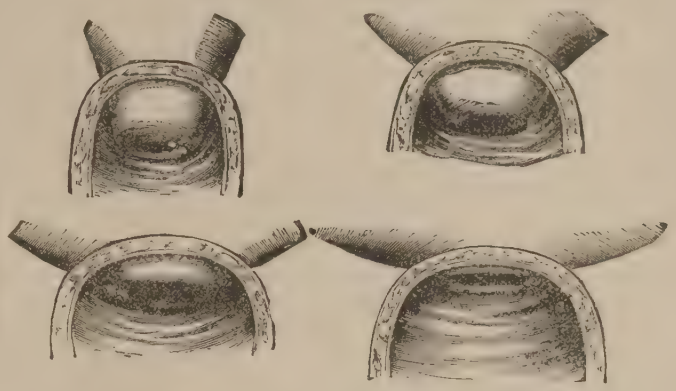
Relation of the Uterus to the Surrounding Parts.—Towards the end of pregnancy the greater part of the anterior surface of the uterus is in contact with the abdominal wall, its lower portion resting on the posterior surface of the symphysis pubis. The posterior surface rests on the spinal column, while the small intestines are pushed to either side, the large intestines surrounding the uterus like an arch.

Changes in the Uterine Parietes.—The great distension of the uterus during pregnancy was formerly supposed to be mainly due to the mechanical pressure of the enlarging ovum within it. If this were so, then the uterine walls would be necessarily much thinner than in the non-pregnant state. This is well known not to be the case, and the immense increase in the size of the uterine cavity is to be explained by the hypertrophy of its walls. At the full period of pregnancy the thickness of the uterine parietes is generally about the same as that of the non-pregnant uterus, rather more at the placental site, and less in the neighborhood of the cervix. Their thickness, however, varies in different cases, and in some women they are so thin as to admit of the fœtal limbs being very readily made out by palpation. Their density is, however, always much diminished, and, instead of being hard and inelastic, they become soft and yielding to pressure. This change coincides with the commencement of pregnancy, of which it forms, as recognizable in the cervix, one of the earliest diagnostic marks. At a more advanced period it is of value as admitting a certain amount of yielding of the uterine walls to the movements of the fœtus, thus lessening the chance of their being injured.

Changes in the Cervix during Pregnancy.—Very erroneous views have long been taught, in most of our standard works on midwifery, as to the changes which occur in the cervix uteri during pregnancy. It is generally stated that, as pregnancy advances, the cervical cavity is greatly diminished in length, in consequence of its being gradually drawn up so as to form part of the general cavity of the uterus, so that in the latter months it no longer exists. In almost all midwifery works accurate diagrams are given of this progressive shortening of the cervix (figs. 67 to 70). The cervix is generally described as having lost one-half of its length at the sixth month, two-thirds at the seventh, and to be entirely obliterated in the eighth and ninth. The correctness of these views was first called in question in recent times by Stoltz, in 1826, but Dr. Duncan,* in an elaborate historical paper on the subject, has shown that Stoltz was anticipated by Weitbrech in 1750, and, to a less degree, by Roederer and other writers. This opinion is now pretty generally admitted to be correct, and is upheld by Cazeaux, Arthur Farre, Duncan, and most modern obstetricians. Indeed, various post-mortem examinations in advanced pregnancy have shown that the cavity of the cervix remains in reality of its normal length of one inch, and it can often be measured during life by the examining finger, on account of its patulous state (fig. 71). During the

* Researches in Obstetrics.

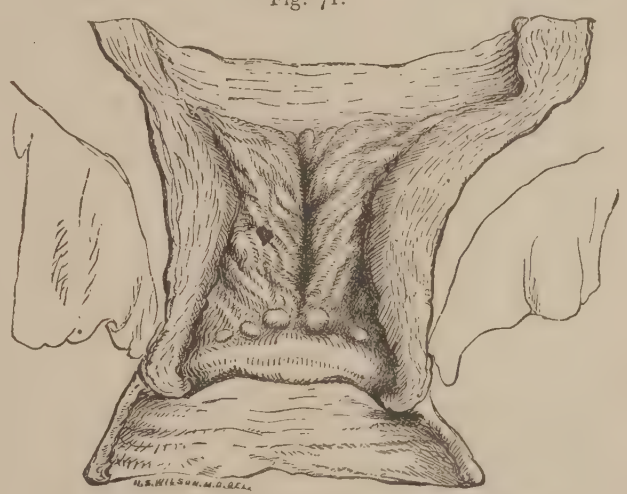
Figs. 67, 68, 69, 70.



Supposed Shortening of the Cervix at the Third, Sixth, Eighth, and Ninth Months of Pregnancy, as Figured in Obstetric Works.

fortnight immediately preceding delivery, however, a real shortening or obliteration of the cervical cavity takes place; but this, as Duncan has pointed out, seems to be due to the incipient uterine contractions, which prepare the cervix for labor.

Fig. 71.



Cervix from a Woman Dying in the Eighth Month of Pregnancy. (After Duncan.)

Apparent Shortening.—There is, no doubt, an apparent shortening of the cervix always to be detected during pregnancy, but this is a fallacious and deceptive feeling, due to the softness of the tissue of the cervix, which is exceedingly characteristic of pregnancy, and which to an experienced finger affords one of its best diagnostic marks.

Softening of the Cervix.—In the non-pregnant state the tissue of the cervix is hard, firm, and inelastic. When conception occurs, softening begins at the external os, and proceeds gradually and slowly upwards until it involves the whole of the cervix. By the end of the fourth month both lips of the os are thick, softened, and velvety to the touch, giving a sensation, likened by Cazeaux to that produced by pressing on a table through a thick, soft cover. By the sixth month at least one-half of the cervix is thus altered, and by the eighth the whole of it, and so much so that at this time those unaccustomed to vaginal examination experience some difficulty in distinguishing it from the vaginal walls. It is this softening, then, which gives rise to the apparent shortening of the cervix so generally described, and it is an invariable concomitant of pregnancy, except in some rare cases in which there has been antecedent morbid induration and hypertrophic elongation of the cervix. If, therefore, on examining a woman supposed to be advanced in

pregnancy, we find the cervix to be hard and projecting into the vaginal canal, we may safely conclude that pregnancy does not exist. The existence of softening, however, it must be remembered, will not of itself justify an opposite conclusion, as it may be produced, to a very considerable extent, by various pathological conditions of the uterus.

The Os Uteri is generally Patulous.—At the same time that the tissue of the cervix is softened, its cavity is widened, and the external os becomes patulous. This change varies considerably in primiparæ and multiparæ. In the former the external os often remains closed until the end of pregnancy; but even in them it generally becomes more or less patulous after the seventh month, and admits the tip of the examining finger. In women who have borne children this change is much more marked. The lips of the external os are in them generally fissured and irregular, from slight lacerations of its tissue in former labors. It is also sufficiently open to admit the tip of the finger, so that in the latter months of pregnancy it is often quite possible to touch the membranes, and through them to feel the presenting part of the child.

Changes in the Texture of the Uterine Tissues.—The remarkable increase in size of the uterus during pregnancy is, as we have seen, chiefly to be explained by the growth of its structures, all of which are modified during gestation. The peritoneal covering is considerably increased, so as still to form a complete covering to the uterus when at its largest size. William Hunter supposed that its extension was effected rather by the unfolding of the layers of the broad ligament, than by growth. That the layers of the broad ligament do unfold during gestation, especially in the early months, is probable; but this is not sufficient to account for the complete investment of the uterus, and it is certain that the peritoneum grows *pari passu* with the enlargement of the uterus. In addition there is a new formation of fibrous tissue between the peritoneal and the muscular coats, which affords strength, and diminishes the risk of laceration during labor.

Muscular Coat.—The hypertrophy of the muscular tissue of the uterus is, however, the most remarkable of the changes produced by pregnancy. Not only do the previously existing rudimentary fibre-cells become enormously increased in size—so as to measure, according to Kölliker, from seven to eleven times their former length, and from two to five times their former breadth—but new unstriped fibres are largely developed, especially in the inner layers. These new cells are chiefly found in the first months of pregnancy, and their growth seems to be completed by the sixth month. The connective tissue between the muscular layers is also largely increased in amount. The weight of the muscular tissue of the gravid uterus is, therefore, much increased, and it has been estimated by Heschl that it weighs at term from 1 to 1.5 pounds, that is, about sixteen times more than in the unimpregnated state. This great development of the muscular tissue admits of its dissection in a way which is quite impossible in the unimpregnated state, and the recent researches of Hélie enable us to understand much better than before how the muscles forming the walls of the gravid uterus act during the expulsion of the child.

The changes in the mucous coat of the uterus, which result in the formation of the decidua, have already been discussed at length elsewhere.

Circulatory Apparatus.—The circulatory apparatus of the uterus during pregnancy has been described when the anatomy of the placenta was under consideration.

Lymphatics.—The lymphatics are much increased in size; and recent theories on the production of certain puerperal diseases attribute to them a more important action than has been commonly assigned to them.

Nerves.—The question of the growth of the nerves has been hotly discussed. Robert Lee took the foremost place among those who maintain that the nerves of the uterus share the general growth of its other constituent parts. Dr. Snow Beck, however, believed that they remain of the same size as in the unimpregnated state, and this view is supported by Hirschfeld, Robin, and other recent writers. Robin thought that there was an apparent increase in the size of the nerve-tubes, which, however, is really due to increase in the neurilemma. Kilian describes the nerves as increasing in length but not in thickness; while Schroeder states that they participate equally with the lymphatics in the enlargement the latter undergo. Whichever of these views may ultimately be found to be correct, it is certain that analogy would lead us to expect an increase of nervous, as well as of vascular, supply.

General Modification in the Body produced by Pregnancy.—It is not in the uterus alone, that pregnancy is found to produce modifications of importance. There are few of the more important functions of the body which are not, to a greater or less extent, affected; to some of these it is necessary briefly to direct attention, inasmuch as, when carried to excess, they produce those disorders which often complicate gestation, and which prove so distressing and even dangerous to the patients. Such of them as are apparent and may aid us in diagnosis are discussed in the chapter which treats of the signs and symptoms of pregnancy; in this place it is only necessary to refer to those which do not properly fall into that category.

Changes in the Blood.—Amongst those which are most constant and important are the alterations in the composition of the blood. The opinion of the profession on this subject has, of late years, undergone a remarkable change. Formerly it was universally believed that pregnancy was, as the rule, associated with a condition analogous to plethora, and that this explained many characteristic phenomena of common occurrence, such as headache, palpitation, singing in the ears, shortness of breath, and the like. As a consequence it was the habitual custom, not yet by any means entirely abandoned, to treat pregnant women on an antiphlogistic system; to place them on low diet, to administer lowering remedies, and very often to practice venesection, sometimes to a surprising extent. Thus it was by no means rare for women to be bled six or eight times during the latter months, even when no definite symptoms of disease existed; and many of the older authors record cases where depletion was practiced every fortnight, as a matter of routine, and, when the symptoms were well marked, even from fifty to ninety times in the course of a single pregnancy.

Composition of the Blood in Pregnancy.—Numerous careful analyses have conclusively proved that the composition of the blood during pregnancy is very generally—perhaps it would not be too much to say always—profoundly altered. Thus it is found to be more watery, its serum is deficient in albumen, and the amount of colored globules is materially diminished, averaging, according to the analyses of Becquerel and Rodier, 111.8 against 127.2 in the non-gravid state. At the same time the amount of fibrine and of extractive matter is considerably increased. The latter observation is of peculiar importance, as it goes far to explain the frequency of certain thrombotic affections, observed in connection with pregnancy and delivery; this hyperinosis of the blood is also considerably increased after labor by the quantity of effete material thrown into the mother's system at that time, to be got rid of by her emunctories. The truth is, that the blood of the pregnant woman is generally in a state much more nearly approaching the condition of anæmia than of plethora, and it is certain that most of the phenomena attributed to plethora may be explained equally well and better on this view. These changes are much more strongly marked at the latter end of pregnancy than at its commencement, and it is interesting to observe that it is then that the concomitant phenomena alluded to are most frequently met with. Cazeaux, to whom we are chiefly indebted for insisting on the practical bearing of these views, contends that the pregnant state is essentially analogous to chlorosis, and that it should be so treated. Objection has not unnaturally been taken to this theory, as implying that a healthy and normal function is associated with a morbid state, and it has been suggested that this deteriorated state of the blood may be a wise provision of nature instituted for a purpose we are not as yet able to understand. It may certainly be admitted that pregnancy, in a perfectly healthy state of the system, should not be

associated with phenomena in themselves in any degree morbid. It must not be forgotten, however, that our patients are seldom, we might safely say never, in a state that is physiologically healthy. The influence of civilization, climate, occupation, diet, and a thousand other disturbing causes that, to a greater or less degree, are always to be met with, must not be left out of consideration. Making every allowance, therefore, for the undoubted fact that pregnancy *ought* to be a perfectly healthy condition, it must be conceded, I think, that in the vast majority of cases coming under our notice it is not entirely so; and the deductions drawn by Cazeaux, from the numerous analyses of the blood of pregnant women, seem to point strongly to the conclusion that the general blood-state is one of poverty and anæmia, and that a depressing and antiphlogistic treatment is distinctly contra-indicated.

Modifications in certain Viscera.—Closely connected with the altered condition of the blood is the physiological hypertrophy of the heart, which is now well known to occur during pregnancy. This was first pointed out by Larcher in 1828, and it has been since verified by numerous observers. It seems to be constant and considerable, and to be a purely physiological alteration intended to meet the increased exigencies of the circulation, which the complex vascular arrangements of the gravid uterus produce. The hypertrophy is limited to the left ventricle; the right ventricle, as well as both auricles, being unaffected. Blot estimates that the whole weight of the heart increases one-fifth during gestation. The more recent researches of Löhlein* render it probable that the hypertrophy is less than these authors have supposed. According to Duroziez† the heart remains enlarged during lactation, but diminishes in size immediately after delivery in women who do not suckle, while in women who have borne many children it remains permanently somewhat larger than in nulliparæ. Similar increase in the size of other organs has been pointed out by various writers, as, for example, in the lymphatics, the spleen, and the liver. Tarnier states that in women who have died after delivery, the organs always show signs of fatty degeneration. According to Gassner the whole body increases in weight during the latter months of pregnancy, and this increase is somewhat beyond that which can be explained by the size of the womb and its contents.

Formation of Osteophytes.—Irregular bony deposits between the skull and the dura mater, in some cases so largely developed as to line the whole cranium, have been so frequently detected in women who have died during parturition, that they are believed by some to be a normal production connected with pregnancy. Ducrest found these osteophytes in more than one-third of the cases in which he performed post-mortem examinations during the puerperal period. Rokitansky, who corroborated the observation, believed this peculiar deposit of bony matter to be a physiological, and not a pathological condition connected with pregnancy; but whether it be so, or how it is produced, has not yet been satisfactorily determined.

Changes in the Nervous System.—More or less marked changes connected with the nervous system are generally observed in pregnancy, and sometimes to a very great extent. When carried to excess they produce some of the most troublesome disorders which complicate gestation, such as alterations in the intellectual functions, changes in the disposition and character, morbid cravings, dizziness, neuralgia, syncope, and many others. They are purely functional in their character, and disappear rapidly after delivery, and may be best described in connection with the disorders of pregnancy.

Changes in the Respiratory Organs.—Respiration is often interfered with, from the mechanical results of the pressure of the enlarged uterus. The longitudinal dimensions of the thorax are lessened by the upward displacement of the diaphragm, and this necessarily leads to some embarrassment of the respiration, which is, however, compensated, to a great extent, by an increase in breadth of the base of the thoracic cavity.

Changes in the Urine.—Certain changes, which are of very constant occurrence, in the urine of pregnant women have attracted much attention, and have been considered by many writers to be pathognomonic. They consist in the presence of a peculiar deposit, formed when the urine has been allowed to stand for some time, which has received the name of *kiestein*. Its presence was known to the ancients, and it was particularly mentioned by Savonarola in the fifteenth century, but it has more especially been studied within the last thirty years by Eguisier, Golding Bird, and others. If the urine of a pregnant woman be allowed to stand in a cylindrical vessel, exposed to light and air, but protected from dust, in a period, varying from two to seven days, a peculiar flocculent sediment, like fine cotton-wool, makes its appearance in the centre of the fluid, and soon afterwards rises to the surface and forms a pellicle, which has been compared to the fat on cold mutton-broth. In the course of a few days the scum breaks up and falls to the bottom of the vessel. On microscopic examination it is found to be composed of fat particles, with crystals of ammoniaco-magnesium phosphates and phosphate of lime, and a large quantity of vibriones. These appearances are generally to be detected after the second month of pregnancy, and up to the seventh or eighth month, after which they are rarely produced. Regnauld explains their absence during the latter months of gestation by the presence in the urine, at that time, of free lactic acid, which increases its acidity, and prevents the decomposition of the urea into carbonate of ammonia. He believes that kiestein is produced by the action of free carbonate of ammonia on the phosphate of lime contained in the urine, and that this reaction is prevented by the excess of acid.

Golding Bird believed kiestein to be analogous to casein, to the presence of which he referred it, and he states that he has found it in twenty-seven out of thirty cases. Braxton Hicks so far corroborates his view, and states that the deposit of kiestein can be much more abundantly produced if one or two teaspoonfuls of rennet be added to the urine, since that substance has the property of coagulating casein. Much less importance, however, is now attached to the presence of kiestein than formerly, since a precisely similar substance is sometimes found in the urine of the non-pregnant, especially in anæmic women, and even in the urine of men. Parkes states that it is not of uniform composition, that it is produced by the decomposition of urea, and consists of the free phosphates, bladder mucus, infusoria, and vaginal discharges. Neugebauer and Vogel give a similar account of it, and hold that it is of no diagnostic value. That it is of interest, as indicating the changes going on in connection with pregnancy, is certain; but inasmuch as it is not of invariable occurrence, and may even exist quite independently of gestation, it is obviously quite undeserving of the extreme importance that has been attached to it.

* Zeitschrift für Geburtshülfe, etc., 1876. † Gaz. des Hôpit. 1868.

CHAPTER VIII.

SIGNS AND SYMPTOMS OF PREGNANCY.—*PLAYFAIR.*

Importance of the Subject.—In attempting to ascertain the presence or absence of pregnancy, the practitioner has before him a problem which is often beset with great difficulties, and on the proper solution of which, the moral character of his patient, as well as his own professional reputation, may depend. The patient and her friends can hardly be expected to appreciate the fact, that it is often far from easy to give a positive opinion on the point; and it is always advisable to use much caution in the examination, and not to commit ourselves to a positive opinion, except on the most certain grounds. This is all the more important, because it is just in those cases in which our opinion is most frequently asked, that the statements of the patient are of least value, as she is either anxious to conceal the existence of pregnancy, or, if desirous of an affirmative diagnosis, unconsciously colors her statements, so as to bias the judgment of the examiner.

Constant attempts have been made to classify the signs of pregnancy; thus some divide them into the *natural* and *sensible* signs, others into the *presumptive*, the *probable*, and the *certain*. The latter classification, which is that adopted by Montgomery in his classical work on the "Signs and Symptoms of Pregnancy," is no doubt the better of the two, if any be required. The simplest way of studying the subject, however, is the one, now generally adopted, of considering the signs of pregnancy in the order in which they occur, and attaching to each an estimate of its diagnostic value.

Signs of a Fruitful Conception.—From the earliest ages authors have thought, that the occurrence of conception might be ascertained by certain obscure signs, such as a peculiar appearance of the eyes, swelling of the neck, or by unusual sensations connected with a fruitful intercourse. All of these, it need hardly be said, are far too uncertain to be of the slightest value. The last is a symptom on which many married women profess themselves able to depend, and one to which Cazeaux is inclined to attach some importance.

Cessation of Menstruation.—The first appreciable indication of pregnancy, on which any dependence can be placed, is the cessation of the customary menstrual discharge, and it is of great importance, as forming the only reliable guide for calculating the probable period of delivery. In women who have been previously perfectly regular, in whom there is no morbid cause which is likely to have produced suppression, the non-appearance of the catamenia may be taken as strong presumptive evidence of the existence of pregnancy; but it can never be more than this, unless verified and strengthened by other signs, inasmuch as there are many conditions besides pregnancy which may lead to its non-appearance. Thus exposure to cold, mental emotion, general debility, especially when connected with incipient phthisis, may all have this effect. Mental impressions are peculiarly liable to mislead in this respect. It is far from uncommon in newly-married women to find that menstruation ceases for one or more periods, either from the general disturbance of the system connected with the married life, or from a desire on the part of the patient to find herself pregnant. Also in unmarried women, who have subjected themselves to the risk of impregnation, mental emotion and alarm often produce the same result.

Menstruation during Pregnancy.—A further source of uncertainty exists in the fact, that in certain cases menstruation may go on for one or more periods after conception, or even during the whole pregnancy. The latter occurrence is certainly of extreme rarity, but one or two instances are recorded by Perfect, Churchill, and other writers of authority, and therefore its possibility must be admitted. The former is much less uncommon, and instances of it have probably come under the observation of most practitioners. The explanation is now well understood. During the early months of gestation, when the ovum is not yet sufficiently advanced in growth to fill the whole uterine cavity, there is a considerable space between the decidua reflexa which surrounds it, and the decidua vera lining the uterine cavity. It is from this free surface of the decidua vera that the periodical discharge comes, and there is not only ample surface for it to come from, but a free channel for its escape through the os uteri. After the third month the decidua reflexa and the decidua vera blend together, and the space between them disappears. Menstruation after this time is, therefore, much more difficult to account for. It is probable that, in many supposed cases, occasional losses of blood from other sources, such as placenta prævia, an abraded cervix uteri, or a small polypus, have been mistaken for true menstruation. If the discharge really occurs periodically after the third month, it can only come from the canal of the cervix. The occurrence, however, is so rare, that if a woman is menstruating regularly and normally, who believes herself to be more than four months advanced in pregnancy, we are justified *ipso facto* in negativing her supposition. In an unmarried woman all statements as to regularity of menstruation are absolutely valueless, for, in such cases, nothing is more common than for the patient to make false statements for the express purpose of deception.

Pregnancy when Menstruation is Normally Absent.—Conception may unquestionably occur when menstruation is normally absent. This is far from uncommon in women during lactation, when the function is in abeyance, and who therefore have no reliable data for calculating the true period of their delivery. Authentic cases are also recorded in which young girls have conceived before menstruation is established, and in which pregnancy has occurred after the change of life.

Estimate of its Diagnostic Value.—Taking all these facts into account, we can only look upon the cessation of menstruation as a fairly presumptive sign of pregnancy in women in whom there is no clear reason to account for it, but one which is undoubtedly of great value in assisting our diagnosis.

Sympathetic Disturbances.—Shortly after conception various sympathetic disturbances of the system occur, and it is only very exceptionally that these are not established. They are generally most developed in women of highly nervous temperament; and they are, therefore, most marked in patients in the upper classes of society, in whom this class of organization is most common.

Morning Sickness.—Amongst the most frequent of these are various disorders of the gastro-intestinal canal. Nausea or vomiting is very common; and as it is generally felt on first rising from the recumbent position, it is popularly known amongst women as

the "morning sickness." It sometimes commences almost immediately after conception, but more frequently not until the second month, and it rarely lasts after the fourth month. Generally there is nausea rather than actual vomiting. The woman feels sick and unable to eat her breakfast, and often brings up some glairy fluid. In other cases, she actually vomits; and sometimes the sickness is so excessive as to resist all treatment, seriously to affect the patient's health, and even imperil her life. These grave forms of the affection will require separate consideration.

Cause of the Sickness.—Very different opinions have been held as to the cause of morning sickness. Dr. Henry Bennet believes that, when at all severe, it is always associated with congestion and inflammation of the cervix uteri. Dr. Graily Hewitt maintains that it depends entirely on flexion of the uterus, producing irritation of the uterine nerves at the seat of the flexion, and consequent sympathetic vomiting. This theory, when broached at the Obstetrical Society, was received with little favor; it seems to me to be sufficiently disproved by the fact, which I believe to be certain, that more or less nausea is a normal and nearly constant phenomenon in pregnancy, for it is difficult to believe that nearly every pregnant woman has a flexed uterus. The generally received explanation is, probably, the correct one, viz., that nausea, as well as other forms of sympathetic disturbance, depends on the stretching of the uterine fibres by the growing ovum, and consequent irritation of the uterine nerves. It is, therefore, one, and only one, of the numerous reflex phenomena naturally accompanying pregnancy. It is an old observation that when the sickness of pregnancy is entirely absent, other, and generally more distressing, sympathetic derangements are often met with, such as a tendency to syncope. Dr. Bedford* has laid especial stress on this point, and maintains that under such circumstances women are peculiarly apt to miscarry.

Other derangements of the digestive functions, depending on the same cause, are not uncommon, such as excessive or depraved appetite, the patient showing a craving for strange and even disgusting articles of diet. These cravings may be altogether irresistible, and are popularly known as "longings." Of a similar character is the disturbed condition of the bowels frequently observed, leading to constipation, diarrhœa, and excessive flatulence.

Other Sympathetic Phenomena.—Certain glandular sympathies may be developed, one of the most common being an excessive secretion from the salivary glands. A tendency to syncope is not infrequent, rarely proceeding to actual fainting, but rather to that sort of partial syncope, unattended with complete loss of consciousness, which the older authors used to call "lypothemia." This often occurs in women who show no such tendency at other times, and, when developed to any extent, it forms a very distressing accompaniment of pregnancy. Toothache is common, and is not rarely associated with actual caries of the teeth. When any of these phenomena are carried to excess it is more than probable that some morbid condition of the uterus exists, which increases the local irritation producing them.

Mental Peculiarities.—Mental phenomena are very general. An undue degree of despondency, utterly beyond the patient's control, is far from uncommon; or a change which renders the bright and good-tempered woman fractious and irritable; or even the more fortunate, but less common change, by which a disagreeable disposition becomes altered for the better.

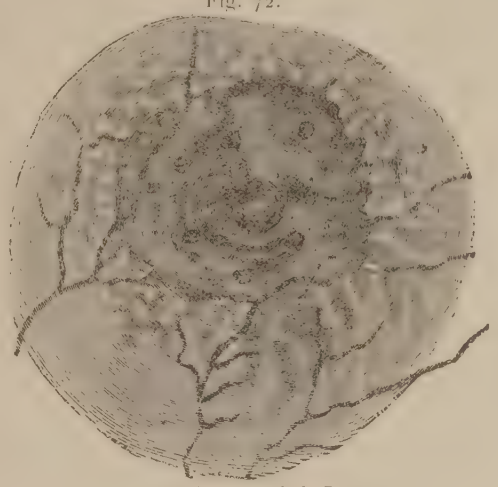
Diagnostic Value.—All these phenomena of exalted nervous susceptibility are but of slight diagnostic value. They may be taken as corroborating more certain signs, but nothing more; and they are chiefly interesting from their tendency to be carried to excess and to produce serious disorders.

Mammary Changes.—Certain changes in the mammæ are of early occurrence, dependent, no doubt, on the intimate sympathetic relations at all times existing between them and the uterine organs, but chiefly required for the purpose of preparing for the important function of lactation, which, on the termination of pregnancy, they have to perform.

* Diseases of Women and Children, p. 551.

Changes in the Areolæ.—Generally about the second month of pregnancy the breasts become increased in size and tender. As pregnancy advances they become much larger and firmer, and blue veins may be seen coursing over them. The most characteristic changes are about the nipples and areolæ. The nipples become turgid, and are frequently covered with minute branny scales, formed by the desiccation of sero-lactescent fluid oozing from them. The areolæ become greatly enlarged and darkened from the deposit of pigment (fig. 72). The extent and degree of this discoloration

Fig. 72.



Appearance of the Areola in Pregnancy.

vary much in different women. In fair women it may be so slight as to be hardly appreciable; while in dark women it is generally exceedingly characteristic, sometimes forming a nearly black circle extending over a great part of the breast. The areola becomes moist as well as dark in appearance and is somewhat swollen, and a number of small tubercles are developed upon it; forming a circle of projections around the nipple. These tubercles are described by Montgomery as being intimately connected with the lactiferous ducts, some of which may occasionally be traced into them and seen to open on their summits. As pregnancy advances they increase in size and number. During the latter months what has been called "the secondary areola" is produced, and when well marked presents a very characteristic appearance. It consists of a number of minute discolored spots all round the outer margin of the areola where the pigmentation is fainter, and which are generally described as resembling spots from which the color had been discharged by a shower of water-drops. This change, like the darkening of the primary areola, is most marked in brunettes. At this period, especially in women whose skin is of fine texture, whitish silvery streaks are often seen on the breasts. They are produced by the stretching of the cutis vera, and are permanent.

By pressure on the breasts a small drop of serous-looking fluid can very generally be pressed out from the nipple often as early as the third month, and on microscopic examination milk and cholostrum globules can be seen in it.

Diagnostic Value of Mammary Changes.—The diagnostic value of these mammary changes has been variously estimated. When well marked they are considered by Montgomery to be certain signs of pregnancy. To this statement, however, some important limitations must be made. In women who have never borne children they, no doubt, are so; for, although various uterine and ovarian diseases produce some darkening of the areola, they certainly never produce the well-marked changes above described. In multiparæ, however, the areolæ often remain permanently darkened, and in them these signs are much less reliable. In first pregnancies the presence of milk in the breasts may be considered an almost certain sign, and it is one which I have rarely failed to detect even from a comparatively early period. It is true that there are authenticated instances of non-pregnant women having an abundant secretion of milk established from mammary irritation. Thus Baudelocque

presented to the Academy of Surgery of Paris a young girl, eight years of age, who had nursed her little brother for more than a month. Dr. Tanner states—I do not know on what authority—that "it is not uncommon in Western Africa for young girls who have never been pregnant to regularly employ themselves in nursing the children of others, the mammæ being excited to action by the application of the juice of one of the euphorbiaceæ." Lacteal secretion has even been noticed in the male breast. But these exceptions to the general rule are so uncommon as merely to deserve mention as curiosities; and I have almost never been deceived in diagnosing a first pregnancy from the presence of even the minutest quantity of lacteal secretion in the breasts, although even then other corroborative signs should always be sought for. In multiparæ the presence of milk is by no means so valuable, for it is common for milk to remain in the mammæ long after the cessation of lactation, even for several years. Tyler Smith correctly says that "suppression of the milk in persons who are nursing and liable to impregnation is a more valuable sign of pregnancy than the converse condition." This is an observation I have frequently corroborated.

As a diagnostic sign, therefore, the mammary appearances are of great importance in primiparæ, and when well marked they are seldom likely to deceive. They are specially important when we suspect pregnancy in the unmarried, as we can easily make an excuse to look at the breast without explaining to the patient the reason; and a single glance, especially if the patient be dark-complexioned, may so far strengthen our suspicion as to justify a more thorough examination. In married multiparæ they are less to be depended upon.

Other Pigmentary Changes.—In connection with this subject may be mentioned various irregular deposits of pigment which are frequently observed. The most common is a dark brownish or yellowish line starting from the pubes and running up to the centre of the abdomen, sometimes as far as the umbilicus only, at others forming an irregular ring round the umbilicus, and reaching to the epigastrium. It is, however, of very uncertain occurrence, being well marked in some women, while in others it is entirely absent. Patches of darkened skin are often observed about the face, chiefly on the forehead, and this bronzing sometimes gives a very peculiar appearance. Joulin states that it only occurs on parts of the face exposed to the sun, and that it is therefore most frequently observed in women of the lower order, who are freely exposed to atmospheric influences. These pigmentary changes are of small diagnostic value, and may continue for a considerable time after delivery.

Enlargement of the Abdomen.—The progressive enlargement of the abdomen, and the size of the gravid uterus at various periods of pregnancy, as well as the method of examination by means of abdominal palpation, have already been described (pp. 33 and 44).

We will now consider the well-known phenomena produced by the movements of the fœtus in utero, which are so familiar to all pregnant women. These, no doubt, take place from the earliest period of fœtal life at which the muscular tissue of the fœtus is sufficiently developed to admit of contraction, but they are not felt by the mother until somewhere about the sixteenth week of utero-gestation, the precise period at which they are perceived varying considerably in different cases. The error of the law on this subject, which supposes the child not to be alive, or "quick," until the mother feels its movements, is well known, and has frequently been protested against by the medical profession. The so-called *quickening*—which certainly is felt very suddenly by some women—is believed to depend on the rising of the uterine tumor sufficiently high to permit of the impulse of the fœtus being transmitted to the abdominal walls of the mother, through the sensory nerves of which its movements become appreciable. The sensation is generally described as being a feeble fluttering, which, when first felt, not unfrequently causes unpleasant nervous sensations. As the uterus enlarges, the movements become more and more distinct, and generally consist of a series of sharp blows or kicks, sometimes quite appreciable to the naked eye, and causing distinct projections of the abdominal walls. Their force and frequency will also vary during pregnancy according to circumstances. At times they are very frequent and distressing; at others, the fœtus seems to be comparatively quiet, and they may even not be felt for several days in succession, and thus unnecessary fears as to the death of the fœtus often arise. The state of the mother's health has an undoubted influence upon them. They are said to increase in force after a prolonged abstinence from food, or in certain positions of the body. It is certain that causes interfering with the vitality of the fœtus often produce very irregular and tumultuous movements. They can be very readily felt by the accoucheur on palpating the abdomen, and sometimes, in the latter months, so distinctly as to leave no doubt as to the existence of pregnancy. They can also generally be induced by placing one hand on each side of the abdomen and applying gentle pressure, which will induce fœtal motion, that can be easily appreciated.

The Diagnostic Value of Fœtal Movements.—As a diagnostic sign the existence of fœtal movements has always held a high place, but care should be taken in relying on it. It is certain that women are themselves very often in error, and fancy they feel the movements of a fœtus when none exists, being probably deceived by irregular contractions of the abdominal muscles, or flatus within the bowels. They may even involuntarily produce such intra-abdominal movements as may readily deceive the practitioner. Of course, in advanced pregnancy, when the fœtal movements are so marked as to be seen as well as felt, a mistake is hardly possible, and they then constitute a certain sign. But in such cases there is an abundance of other indications and little room for doubt. In questionable cases, and at an earlier period of pregnancy, the fact that movements are not felt must not be taken as a proof of the non-existence of pregnancy, for they may be so feeble as not to be perceptible, or they may be absent for a considerable period.

Intermittent Uterine Contractions.—Braxton Hicks* has directed attention to the value, from a diagnostic point of view, of intermittent contractions of the uterus during pregnancy. After the uterus is sufficiently large to be felt by palpation, if the hand be placed over it, and it be grasped for a time without using any friction or pressure, it will be observed to distinctly harden in a manner that is quite characteristic. This intermittent contraction occurs every five or ten minutes, sometimes oftener, rarely at longer intervals. The fact that the uterus did contract in this way had been previously described, more especially by Tyler Smith, who ascribed it to peristaltic action. But it is certain that no one, before Dr. Hicks, had pointed out the fact that such contractions were constant and normal concomitants of pregnancy, continuing during the whole period of utero-gestation, and forming a ready and reliable means of distinguishing the uterine tumor from other abdominal enlargements. Since reading Dr. Hicks's paper I have paid considerable attention to this sign, which I have never failed to detect, even in the retroverted gravid uterus contained entirely in the pelvic cavity, and I am disposed entirely to agree with him as to its great value in diagnosis. If the hand be kept steadily on the uterus, its alternate hardening and relaxation can be appreciated with the greatest ease. The advantages which this sign has over the fœtal movements are that it is constant, that it is not liable to be simulated by anything else, and that it is independent of the life of the child, being equally appreciable when the uterus contains a degenerated ovum or dead fœtus. The only condition likely to give rise to error is an enlargement of the uterus in consequence of contents other than the results of conception, such as retained menses, or a polypus. The history of such cases—which are moreover of extreme rarity—would easily prevent any mistake. As a corroborative sign of pregnancy, therefore, I should give these intermittent contractions a high place.

Vaginal Signs of Pregnancy.—The vaginal signs of pregnancy are of considerable importance in diagnosis. They are chiefly the

* Obst. Trans., v. 13.

changes which may be detected in the cervix, and the so-called *ballottement*, which depends on the mobility of the fœtus in the liquor amnii.

Softening of the Cervix.—The alterations in the density and apparent length of the cervix have been already described. When pregnancy has advanced beyond the fifth month the peculiar velvety softness of the cervix is very characteristic, and affords a strong corroborative sign, but one which it would be unsafe to rely on by itself, inasmuch as very similar alterations may be produced by various causes. When, however, in a supposed case of pregnancy advanced beyond the period indicated, the cervix is found to be elongated, dense, and projecting into the vaginal canal, the non-existence of pregnancy may be safely inferred. Therefore the negative value of this sign is of more importance than the positive.

Ballottement, when distinctly made out, is a very valuable indication of pregnancy. It consists in the displacement, by the examining finger, of the fœtus, which floats up in the liquor amnii, and falls back again on the tip of the finger with a slight tap which is exceedingly characteristic.

Method of Examination.—In order to practice it most easily, the patient is placed on a couch or bed in a position midway between sitting and lying, by which the vertical diameter of the uterine cavity is brought into correspondence with that of the pelvis. Two fingers of the right hand are then passed high up into the vagina in front of the cervix. The uterus being now steadied from without by the left hand, the intravaginal fingers press the uterine wall suddenly upwards, when, if pregnancy exist, the fœtus is displaced, and in a moment falls back again, imparting a distinct impulse to the fingers. When easily appreciable it may be considered as a certain sign, for although an ante-flexed fundus, or a calculus in the bladder, may give rise to somewhat similar sensations, the absence of other indications of pregnancy would readily prevent error. Ballottement is practiced between the fourth and seventh months. Before the former time the fœtus is too small, while at a later period it is relatively too large, and can no longer be easily made to rise upwards in the surrounding liquor amnii. The absence of ballottement must not be taken as proving the non-existence of pregnancy, for it may be inappreciable from a variety of causes, such as abnormal presentations, or the implantation of the placenta upon the cervix uteri.

Vaginal Pulsation.—There are also some other vaginal signs of pregnancy of secondary consequence. Amongst these is the vaginal pulsation, pointed out by Osiander, resulting from the enlargement of the vaginal arteries, which may sometimes be felt beating at an early period. Often this pulsation is very distinct, at other times it cannot be felt at all, and it is altogether unreliable, as a similar pulsation may be felt in various uterine diseases.

Uterine Fluctuation.—Dr. Rasch has drawn attention to a previously undescribed sign which he believes to be of importance in the diagnosis of early pregnancy.* It consists in the detection of fluctuation through the anterior uterine wall, depending on the presence of the liquor amnii. In order to make this out, two fingers of the right hand must be used, as in ballottement, while the uterus is steadied through the abdomen. Dr. Rasch states that by this means the enlarged uterus in pregnancy can easily be distinguished from the enlargement depending on other causes, and that fluctuation can always be felt as early as the second month. If it is associated with suppressed menstruation and darkened areolæ, he considers it a certain sign. In order to detect it, however, considerable experience in making vaginal examinations is essential, and it can hardly be depended on for general use.

Alteration in Color of the Vagina.—A peculiar deep violet hue of the vaginal mucous membrane was relied on by Jacquemier and Klüge as affording a readily-observed indication of pregnancy. In most cases it is well marked; sometimes, indeed, the change of color is very intense, and it evidently depends on the congestion produced by pressure of the enlarged uterus. The same effect, however, is constantly seen where similar pressure is effected by large fibroid tumors of the uterus, and, therefore, for diagnostic purposes it is valueless.

Auscultatory Signs of Pregnancy.—By far the most important signs are those which can be detected by abdominal auscultation, and one of these—the hearing of the fœtal heart-sounds—forms the only sign which *per se*, and in the absence of all others, is perfectly reliable.

Discovery of Fœtal Auscultation.—The fact that the sounds of the fœtal heart are audible during advanced pregnancy was first pointed out by Mayor of Geneva in 1818, and the main facts in connection with fœtal auscultation were subsequently worked out by Kergaradec, Naegele, Evory Kennedy, and other observers. The pulsations first become audible, as a rule, in the course of the fifth month, or about the middle of the fourth month. In exceptional circumstances, and by practiced observers, they have been heard earlier. Depaul believes that he detected them as early as the eleventh week, and Routh has also detected them at an early period by vaginal stethoscopy, which, however, for obvious reasons, cannot be ordinarily employed. Naegele never heard them before the eighteenth week, more generally at the end of the twentieth, and for practical purposes the pregnancy must be advanced to the fifth month before we can reasonably expect to detect them. From this period up to term they can almost always be heard, if not at the first attempt, at least afterwards, to a certainty, if we have the opportunity of making repeated examinations. Accidental circumstances, such as the presence of an unusual amount of flatus in the intestines, may deaden the sounds for a time, but not permanently. Depaul only failed to hear them in eight cases out of 906 examined during the last three months of pregnancy; and out of 180 cases, which Dr. Anderson of Glasgow carefully examined, he only failed in twelve, and in each of these the child was still-born. They, therefore, form not only a most certain indication of pregnancy, but of the life of the fœtus also.

Description of the Sound.—The sound has been always likened to the double tic-tac of a watch heard through a pillow, which it closely resembles. It consists of two beats, separated by a short interval, the first being the loudest and most distinct, the second being sometimes inaudible. The rapidity of the fœtal pulsations forms an important means of distinguishing them from transmitted maternal pulsations, with which they might be confounded. Their average number is stated by Slater, who made numerous observations on this point, to be 132, but sometimes they reach as high as 140, and sometimes as low as 120. It will thus be seen that the pulsations are always much more rapid than those of the mother's heart, unless, indeed, the latter be unduly accelerated by transient mental emotion or disease. To avoid mistakes, whenever the fœtal heart is heard its rate of pulsation should be carefully counted, and compared with that of the mother's pulse; if the rates differ, we may be sure that no error has been made. The rapidity of the fœtal pulsations remains, as a rule, the same during the whole period of pregnancy, while their intensity gradually increases. They may, however, be temporarily increased or diminished in frequency by disturbing causes, such as the pressure of the stethoscope, which, exciting tumultuous movements of the fœtus, may induce greatly increased frequency of its heart-beats. So also during labor, after the escape of the liquor amnii, when the contractions of the uterus have a very distinct influence on the fœtus, they may be greatly modified. An acceleration or irregularity of the pulsations, made out in the course of a prolonged labor, may thus be of great practical importance, by indicating the necessity for prompt interference. Similar alterations, associated with tumultuous and unusual fœtal movements felt by the mother towards the end of pregnancy, may point to danger to the life of the fœtus during the latter months, and may even justify the induction of premature labor. This is especially the case in women who have previously given birth to a succession of dead children owing to disease of the placenta, and, in them, careful and frequently repeated auscultations may warn us of the impending danger.

* Brit. Med. Journ., vol. ii., 1873.

Supposed difference of Rapidity according to the Sex of Fœtus.—The rapidity of the fœtal heart has been supposed by some to afford a means of determining the sex of the child before birth. Frankenhauser, who first directed attention to this point, is of opinion that the average rate of pulsations of the heart is considerably less in male than in female children, averaging 124 in the minute in the former, as against 144 in the latter. Steinbach makes the difference somewhat less, viz., 131 for males, and 138 for females. He predicted the sex correctly by this means in forty-five out of fifty-seven cases, while Frankenhauser was correct in the whole fifty cases which he specially examined with reference to the point. Dr. Hutton, of New York,* was also correct in seven cases he fixed on for trial. Devilliers found the difference in the sexes to be the same as Steinbach; he attributes it, however, to the size and weight, rather than to the sex of the child, and believes the pulsations to be least numerous in large and well-developed children. As male children are usually larger than female, he thus explains the relatively less frequent pulsations of their hearts. Dr. Cumming, of Edinburgh, also believes that the weight of the child has considerable influence on the frequency of its cardiac pulsations, so that a large female child may have a slower pulse than a small male.† The point, however, is more curious than practical, and the rapidity of the pulsations certainly would not justify any positive prediction on the subject. Circumstances influencing the maternal circulation seem to have no influence on that of the fœtus.

Site at which the Sounds are heard.—The fœtal heart-sounds are generally propagated best by the back of the child, and are, therefore, most easily audible when this is in contact with the anterior wall of the uterus, as is the case in the large majority of pregnancies. When the child is placed in the dorso-posterior position, the sounds have to traverse a larger amount of the liquor amnii, and are further modified by the interposition of the fœtal limbs. They are, therefore, less easily heard in such cases, but even in them they can almost always be made out. As the fœtus most frequently lies with the occiput over the brim of the pelvis, and the back of the child towards the left side of the mother, the heart-sounds are usually most distinctly audible at a point midway between the umbilicus and the left anterior-superior spine of the ilium. In the next most common position, in which the back of the child lies to the right lumbar region of the mother, they are generally heard at a corresponding point at the right side, but in this case they are frequently more readily made out in the right flank, being then transmitted through the thorax of the child, which is in contact with the side of the uterus. In breech cases, on the other hand, the heart-sounds are generally heard most distinctly *above* the umbilicus, and either to the right or left, according to the side towards which the back of the child is placed. It will thus be seen that the place at which the fœtal heart-sounds are heard varies with the position of the fœtus; and this, when combined with the information derived from palpation, affords a ready means of ascertaining the presentation of the child before labor. The sounds are only audible over a limited space, about two to three inches in diameter; therefore, if we fail to detect them in one place, a careful exploration of the whole uterine tumor is necessary before we are satisfied that they cannot be heard.

Sources of Fallacy.—The only mistake that is likely to be made is taking the maternal pulsations, transmitted through the uterine tumor, for those of the fœtal heart. A little care will easily prevent this error, and the frequency of the mother's pulse should always be ascertained before counting the supposed fœtal pulsations. If these are found to be 120 or more, while the mother's pulse is only 70 or 80, no mistake is possible. If the latter is abnormally quickened greater care may be necessary, but even then the rate of pulsation of each will be dissimilar. Braxton Hicks‡ has pointed out that in tedious labor, when the muscular powers of the mother are exhausted, the muscular subsurrus may produce a sound closely resembling the fœtal pulsation; but error from this source is obviously very improbable.

Mode of practising Auscultation.—In listening for the fœtal heart-sounds the patient should be placed on her back, with the shoulders elevated and the knees flexed. The surface of the abdomen should be uncovered, and an ordinary stethoscope employed, the end of which must be pressed firmly on the tumor, so as to depress the abdominal walls. The most absolute stillness is necessary, as it is often far from easy to hear the sounds. Sometimes, after failing with the ordinary stethoscope, I have succeeded with the bin-aural, which remarkably intensifies them. When once heard they are most easily counted during a space of five seconds, as, on account of their frequency, it is not always possible to follow them over a longer period.

Value of this Sign of Pregnancy.—When the fœtal heart-sounds are heard distinctly, pregnancy may be absolutely and certainly diagnosed. The fact that we do not hear them does not, however, preclude the possibility of gestation, for the fœtus may be dead, or the sounds temporarily inaudible.

Umbilical Souffle.—There are some other sounds heard in auscultation which are of very secondary diagnostic value. One of these is the so-called *umbilical or funic souffle*, which was first pointed out by Evory Kennedy. It consists of a single blowing murmur, synchronous with the fœtal heart-sounds, and most distinctly heard in the immediate vicinity of the point where these are most audible. Most authors believe it to be produced by pressure on the cord, either when it is placed between a hard part of the fœtus and the uterine walls, or is twisted round the child's neck. Schroeder and Hecker detected it in fourteen or fifteen per cent. of all cases, and the latter believed it to be caused by flexure of the first portion of the cord near the umbilicus. For practical purposes it is quite valueless, and need only be mentioned as a phenomenon which an experienced auscultator may occasionally detect.

Uterine Souffle.—The uterine souffle is a peculiar single whizzing murmur which is almost always audible on auscultation. It varies very remarkably in character and position. Sometimes it is a gentle blowing or even musical murmur; at others it is loud, harsh, and scraping; sometimes continuous, sometimes intermittent. It may also be heard at any point of the uterus, but most frequently low down, and to one or other side; more rarely above the umbilicus, or towards the fundus; and it often changes its position so as to be heard at a subsequent auscultation at a point where it was previously inaudible. It may be heard over a space of an inch or two only, or, in some cases, over the whole uterine tumor; or again, it may sometimes be detected simultaneously over two entirely distinct portions of the uterus. It is generally to be heard earlier than the fœtal heart-sounds, often as soon as the uterus rises above the brim of the pelvis, and it can almost always be detected after the commencement of the fourth month. The sound becomes curiously modified by the uterine contractions during labor, becoming louder and more intense before the pain comes on, disappearing during its acme, and again being heard as it goes off. Hicks attributes to a similar cause, viz., the uterine contractions during pregnancy, the frequent variations in the sound which are characteristic of it.§ The uterine souffle is also audible after the death of the fœtus, and it is believed by some to be modified and to become more continuously harsh when that event has taken place.

Theories as to its Cause.—Very various explanations have been given of the causes of this sound. For long it was supposed to be formed in the vessels of the placenta, and hence the name "*placental souffle*," by which it is often talked of; or if not in the placenta, in the uterine vessels in its immediate neighborhood. The non-placental origin of the sound is sufficiently demonstrated by the fact that it may be heard for a considerable time after the expulsion of the placenta. Some have supposed that it is not formed in the uterus at all, but in the maternal vessels, especially the aorta and the iliac arteries, owing to the pressure to which they are subjected

* New York Med. Journ., July, 1872. † Edin. Med. Journ., 1875.
‡ Obst. Trans., vol. xv.

§ Op. cit. p. 233.

by the gravid uterus. The extreme irregularity of the sound, its occasional disappearance, and its variable site, seem to be conclusive against this view. The theory which refers the sound to the uterine vessels is that which has received most adherents, and which best meets the facts of the case; but it is by no means easy or even possible to account for the exact mode of its production in them. Each of the explanations which have been given is open to some objection. It is far from unlikely that the intermittent contractions of the uterine fibres, which are known to occur during the whole course of pregnancy, may have much to do with it, by modifying, at intervals, the rapidity of the circulation in the vessels. Its production in this manner may also be favored by the chlorotic state of the blood, to which Cazeaux and Scanzoni are inclined to attribute an important influence, likening it to the anæmic murmur so frequently heard in the vessels in weakly women.

Diagnostic Value.—From a diagnostic point of view the uterine souffle is of very secondary importance, because a similar sound is very generally audible in large fibroid tumors of the uterus, and even in some few ovarian tumors; it is, therefore, of little or no value in assisting us to decide the character of the abdominal enlargement. The supposed dependence of the sound on the placental circulation has caused its site to be often identified with that of the placenta. It is, however, most frequently heard at the lower part of the uterus, while the placenta is generally attached near the fundus, so that its position cannot be taken as any safe guide in determining the situation of that viscus.

Sounds produced by the Movements of the Fœtus.—Occasionally, in practising auscultation, irregular sounds of brief duration may be heard, which are not susceptible of accurate description, and which doubtless depend on the sudden movements of the fœtus in the liquor amnii, or on the impact of its limbs on the uterine walls. When heard distinctly they are characteristic of pregnancy; and they may be sometimes heard when the other sounds cannot be detected. They are, however, so irregular, and so often entirely absent, that they can hardly be looked upon in any other light than as occasional phenomena.

Sounds referred to Decomposition of the Liquor Amnii and to separation of the Placenta.—Two other sounds have been described as being sometimes audible, which may be mentioned as matters of interest, but which are of no diagnostic value. One is a rustling sound, said by Stoltz to be audible in cases in which the fœtus is dead, and which he refers to gaseous decomposition of the liquor amnii; its existence is, however, extremely problematical. The other is a sound heard after the birth of the child, and referred by Caillant to the separation of the placental adhesions. He describes it as a series of rapid short scratching sounds, similar to those produced by drawing the nails across the seat of a horse-hair sofa. Simpson* admits the existence of the sound, but believed that it is produced by the mere physical crushing of the placenta, and artificially imitated it out of the body by forcing the placenta through an aperture the size of the os uteri.

Relative Value of the Signs and Symptoms of Pregnancy.—It will be seen, then, that although there are numerous signs and symptoms accompanying pregnancy, many of them are unreliable by themselves, and apt to mislead. Those which may be confidently depended on are the pulsations of the fœtal heart, which, however, fail us in cases of dead children; the fœtal movements when distinctly made out; ballottement; the intermittent contractions of the uterus; and to these we may safely add the presence of milk in the breasts, provided we have to do with a first pregnancy.

The remainder are of importance in leading us to suspect pregnancy, and in corroborating and strengthening other symptoms, but they do not, of themselves, justify a positive diagnosis.

CHAPTER IX.

PATHOLOGY OF PREGNANCY.—*CAZEAUX.*† (*S. TARNIER'S LATEST REVISED EDITION.*)

The pathology of pregnancy comprises all functional derangements occurring in pregnant women, as well as all spontaneous or accidental lesions of the ovum which may compromise the health or life of the fœtus. As the latter class usually either escape detection, or are not discovered until it is too late to remedy them, they will be considered briefly; all, in fact, that can be said of them is limited to certain questions of pathological anatomy, foreign to the main object of this work.

[Some of the numerous diseases observed during pregnancy are the result of this condition; others occur, as it were, by chance, and often happen under other circumstances. On this account they are treated of in separate chapters; a division, however, which is far from perfect, as the distinction between the two classes cannot always be defined. The ninth chapter is devoted to the diseases which may occur during pregnancy, and the tenth to those which are the result of it. Afterward are described extra-uterine pregnancies, lesions of the ovum and of the placenta, and diseases of the fœtus and its death.]

OF THE DISEASES WHICH MAY EXIST DURING PREGNANCY AND OF THE RECIPROCAL INFLUENCE WHICH THEY MAY HAVE UPON THEIR PROGRESS AND TERMINATION.

Though, says Antoine Petit, pregnancy exposes women to various disorders, it also protects them from many very dangerous diseases, arrests the progress of others, and sometimes even cures those with which they were previously affected. This proposition, though asserted almost as a maxim by the author quoted, is, unfortunately, far from being strictly true. Antoine Petit was indeed strangely deceived in his appreciation of the influence of pregnancy upon acute diseases existing before it or occurring during its progress; still, as many physicians partake of his error, we have thought it right to notice it at the outset.

§ 1. Epidemic Diseases.

1. *Influenza.*—Though some epidemics have appeared to spare pregnant women, many have affected them as severely, at least, as other individuals exposed to the same influences. Thus I found, as did also M. Jacquemier, at the Maternity Hospital, that the epidemic of influenza attacked a great many pregnant women; but, contrary to his observation, I witnessed numerous abortions as a consequence either of the disease itself, or of the violent spells of coughing which tormented the patients.

2. *Cholera.*—The severe epidemics of cholera which, in 1832 and 1849, were so fatal in the capital, did not spare pregnant

* Selected Obstet. Works, p. 151.

† This article on the Pathology of Pregnancy is from that author's great work on Midwifery, the translation of which is published by P. Blakiston, Son & Co., Philadelphia, Pa., and allowed in this Encyclopædia by their kind permission.

women; and we had the pain of witnessing the death of quite a number.

Dr. Bouchut has endeavored, in a quite recent work, to appreciate the effect of pregnancy upon cholera, and *vice versa*. Relying upon 52 observations, he commences by showing that pregnancy has no influence upon the invasion of cholera, that it protects from it no more than it predisposes to it, and that when the disease appears, it does so without any modification, in all its forms and severity.

Cholera has, however, an incontestable influence upon the course of gestation, often shortening its duration. Thus, 25 women out of 52 aborted in consequence of the disease, and the same would probably have been the case with others, had not the patients been removed by an early death. Except in some rare instances, abortion took place only in cases in which the disease lasted over twenty-four hours.

Of the 25 women who aborted, 16 recovered; 12 had the disease with moderate severity, though lasting for a considerable time; the attack in 4 was dangerous and rapid, and 9 died.

The observations of M. Bouchut have elicited the remarkable fact that abortion is very common in cholera patients after the fifth month of pregnancy, but very rare at its commencement. Thus, of the 16 women who aborted and recovered, only one was three months pregnant, 1 four, 6 five, and 1 six; and the least advanced of the 9 who died after abortion had reached four months and a half.

Of the 27 women who did not miscarry, only 6 recovered and had their pregnancies to continue. The attacks which they suffered were of medium severity, and of several days' duration; 21 died with the disease in a dangerous and rapid form.

Altogether there were 30 deaths out of 52 cases. We see, therefore, that the prognosis of cholera is not rendered more favorable by the state of pregnancy.

We have said that 6 of the patients recovered, and had their pregnancies to pursue their regular course. Others, who had reached a more advanced stage, were delivered prematurely of living children. From this, it plainly results that cholera is not always communicated to the fœtus, and that though the latter usually succumbs either before its expulsion, or before the mother, in those cases where her early decease did not allow the abortion to take place, its death cannot be attributed to a transmission of the disease. Besides, the autopsy of the children revealed nothing which could be regarded as pertaining to cholera.

What, then, is the cause of the death of the fœtus, preceding, as it almost always does, its own expulsion, or the death of the mother?

M. Bouchut thinks that it is a consequence either of a mechanical compression of the uterus produced by the cramps and convulsions of the abdominal muscles, or to the severe diet to which the patients are subjected; again he supposes that it may be occasioned by the profuse discharges from the bowels, which, by depriving the blood of its serum, dry up, as it were, the sources of nutrition. For my own part, I regard asphyxia as the only, or at least the usual, cause of the death of the fœtus. The coagulation of the blood, and its stagnation in the vessels, are evidently calculated to suspend the utero-placental circulation; and the interruption of the latter, depriving the fœtus as it does of the means of respiration, must necessarily lead to its rapid death.

M. Devilliers, Jr., read before the Academy of Medicine an observation tending to prove that abortion has a favorable effect upon the termination of cholera, and causing him to feel justified in recommending the provocation of premature labor, as a means of diminishing the danger of the disease. In examining under this point of view the results furnished by M. Bouchut, a result favorable to the opinion of M. Devilliers is at once discoverable; since of the 27 patients who did not miscarry, 21 died, whilst 9 deaths only occurred after 25 abortions. Still, it should be observed, that of the women who recovered after aborting, 4 only had the disease in a rapid and dangerous form; whilst of the 21 who died undelivered, the disease was very severe, and barely lasted a few days. This early fatal termination was, very probably, the only cause which prevented abortion.

The view of M. Devilliers cannot, therefore, be received without new confirmatory observations.

In short, though pregnancy does not affect sensibly the progress and danger of cholera, the latter leads, in the great majority of cases, to the death or premature expulsion of the fœtus.

§ 2. Endemic Diseases.

Intermittent Fever.—There can be no doubt that, as M. Ebrard has endeavored to prove, the grave disorders and deep perturbations produced throughout the economy by the febrile paroxysms, the obstinate vomitings which attended many of them, and the cough, diarrhœa, and colics, may disturb greatly the functions of the womb; also that the fluxion and congestion so often produced by this fever, may cause the premature expulsion of the product of conception.

The possibility of the occurrence being incontestable, the indication to remove the morbid condition follows as a matter of course. I mention this influence of intermittent fever upon the pregnant condition only as affording an opportunity of discarding completely the advice of some persons who recommend the rejection of sulphate of quinine, as likely to produce abortion or premature labor. The miscarriages laid to the charge of the sulphate of quinine should certainly be attributed to the disease itself, and not to the remedy. For my own part, I have had occasion to use it six times at various periods of pregnancy, in doses of ten, twelve, and even fifteen grains in the twenty-four hours, without having had to repent of it. Many practitioners, who, like MM. Thezet, Delmaz, Alamo, and Ebrard, have long practised in localities where this fever is endemic, have never been obliged to complain of the action of sulphate of quinine when administered during pregnancy. Not only is it an innocent remedy, but the surest preventive means when abortion is imminent in consequence of the fever.

[Some facts go to prove that pregnant women attacked with intermittent fever may communicate the disease to the fœtus. Dr. Stokes, of Dublin, states, that he saw a case of tertian ague during pregnancy in which the fœtus was affected with convulsive movements remarkable for their correspondence with the apyretic days of the mother.

M. Pitre-Aubanais relates two cases of intermittent fever communicated to the fœtus by the mother. Both of these children were born with hypertrophied spleens, and their attacks of fever coincided both as to day and hour with those of the mother. (Bourgeois de Turcoing.)

M. Jacquemier also says, that it would seem that intermittent fever may attack both mother and fœtus at the same time, and the facts upon which he bases his assertion, though few, appear conclusive. Schurig relates that a woman had a rebellious quartan ague in the second month of her third pregnancy, and that in the last month, either before or after the paroxysms, she felt the child to be excited, shiver, and roll perceptibly from one side to the other. At last, after a severe paroxysm, she was delivered of a girl which had a violent attack of fever at the same hour with the mother, and which continued to return during seven weeks. Similar cases were observed by Hoffman and Russell. (Jacquemier, *Traité d'Obstetrique.*)]

§ 3. Eruptive Fevers.

1. *Variola.*—The *eruptive fevers* seem, generally, to be much more dangerous to pregnant women than to other individuals. Variola, especially, of all these diseases, has the most disastrous influence upon the pregnant condition; some authors, indeed, state that it is almost uniformly fatal, particularly when it produces abortion.

It is important, as regards the prognosis, to distinguish between the confluent and discrete forms of small-pox. (Chaigneau.) The former, which is so fatal, independent of pregnancy, as to destroy a third of whom it attacks, is still more to be dreaded during gestation, sparing, as it does, almost none of its victims; the latter, on

the contrary, is far from always occasioning abortion or premature labor, and even where the pregnancy is ended before term, the mother often recovers.

Dr. Gariel thinks that the lumbar pains, which are so severe in the first stage of variola, have a great tendency to produce abortion. I have seen in two cases of the discrete form, slight contractions coinciding with these lumbar pains; but I was able to arrest them by the use of opiate injections. In several other instances, I witnessed nothing of the kind, and I think with M. Chaigneau (Thesis, 1847), that abortion is specially liable to occur when the pustules are in full suppuration, and the secondary fever appears, in connection with the grave symptoms which usually accompany it.

To recapitulate: confluent small-pox nearly always occasions abortion, and this is almost uniformly followed by the death of the mother: out of 23 abortions observed by M. Serres under these circumstances, there were 22 deaths. Discrete small-pox, on the contrary, generally allows the pregnancy to continue its course, and even when it interrupts its progress, the mother usually recovers, and in the latter months the child is expelled alive.

When the fœtus is not expelled, it may continue to grow, and often it does not appear at birth to have suffered much from the disease which had endangered its mother's life so greatly; in other cases, however, either because it receives the germ of the disease which affects the mother, or because the deep-seated disorders which the variola produces in the maternal system also exert an unfavorable influence upon the fœtal life, it soon perishes. In the former case, variolous pustules, in every respect similar to those on the mother, may be detected on the body of the child.

[We have just stated that the unborn child of a mother affected with variola may contract the same disease, a fact attested by various authors. In this case, the mother communicates a contagious disease with which she is herself suffering; but it would be wrong to suppose that every pregnant woman having variola must necessarily transmit it to her child. M. Serres knew of twenty-two non-variolous children born of women who had the disease during pregnancy. Mead even holds that if the woman does not abort, her child is exempt from variola for the rest of its life, provided it be not born before the maturity of the eruption. The fact is curious, but denied by Contugno, whose opinion may find support in the following facts: Two pregnant women were inoculated; the eruption was discrete, and gestation progressed. At the usual period they were delivered of healthy children, which, at three years of age, were inoculated and had the regular disease.

On the other hand, it seems that the fœtus only may have variola before birth, even though the mother may never have had it. Though the fact may appear extraordinary, it cannot be questioned in opposition to the testimony of such credible authors as Ebel, Kesler, Watron, Jenner, Deneux, Royer, Bouchut, and Chaigneau, all of whom have seen children born with variola, the mothers being free from the disease. In several of these cases, the mothers having been vaccinated were insusceptible to the epidemic influence, yet were able to communicate the virus to the fœtus.

Congenital variola appears at all stages of pregnancy. Before the third month it is rare; and generally it is discrete, so that there may not be at the utmost more than a hundred pustules on the entire body, and often many less. It is observed that the pustules do not follow the same course of evolution as they do in the open air, but being always bathed in the amniotic fluid present the same phenomena as those which affect the mucous membranes. They are whitish and flattened, but larger than such as are found in the cavity of the mouth. A few become resolved, but others ulcerate quickly when the slight pseudo-membranous disk covering them falls off. The wound suppurates little, never furnishes crusts on account of the moist state of the parts, and cicatrizes without leaving any mark. Occasionally, however, the characteristic scar is seen, but even then is very superficial.

When mother and fœtus have variola at the same time, the pustules appear at the same time in both. M. Chaigneau has, however, seen a few cases in which it was later in the children, not occurring until long after it had disappeared from the mother. The unborn child affected with variola is almost sure to die. (*Bourgeois de Tourcoing.*)]

2. *Scarlatina*, when of some severity, acts in nearly the same way as variola; the danger, however, is usually far less both to mother and child. It sometimes gives rise to abortion, and then the patients very often succumb. My opinion coincides with that of M. Serres, who thinks that women are much more likely to contract the disease when recently delivered than they are during pregnancy, for I have never seen scarlatina during gestation, though I have had the misfortune to lose two newly-delivered females from the disease.

3. *Measles*, according to Levret, is quite as grave as the preceding. In four cases, however, observed by M. Grisolle, the regular course of gestation was undisturbed, and two similar instances have come under my own notice.

[Unfortunately, however, this is not always the case, for M. Bourgeois de Tourcoing, from whose excellent memoir we have made several extracts whilst preparing this chapter, has himself met with fifteen cases of rubeola in pregnant women, eight of whom either aborted or were delivered prematurely. In the remainder the pregnancy was not interfered with. In the former the disease was most severe in the most advanced cases, and the first symptoms of abortion or delivery appeared toward the end of the disease.

Very rarely have children been born affected with rubeola; Rosen and Vogel relate some cases; Guersant met with one, and Bourgeois mentions another, in which the child lived but three days.

§ 4. Various Sporadic Diseases.

1. *Typhoid Fever.*—Typhoid fever may occur at any stage of pregnancy. It often causes abortion, which may take place in the first or second week of the disease.

According to Bourgeois, of twenty-two cases attacked early in pregnancy, six who had the disease lightly did not abort, whilst out of sixteen grave cases twelve aborted. Of fifteen cases of fever occurring during and after the seventh month, the same observer notes nine cases of premature delivery. Of these, five occurred during the first week of the disease; five of the children were still-born, one lived two days, and one survived.

The remaining women were delivered during the second week of the fever; two of the children died during labor; one lived two days and a half, and one only was raised, being an eight-months' child. The two surviving children presented nothing peculiar.]

Though I have rarely had occasion to observe typhoid fever during pregnancy, I have frequently seen it occur during the lying-in. Its commencement is usually insidious, the first symptoms having always been those of a puerperal inflammation, and presenting all the characters of the typhoid disease only after the lapse of the first few days, and the disappearance of the abdominal symptoms. What is very singular, if I may judge by the cases which I have observed, the typhoid fever, so far from being influenced unfavorably by the puerperal state, is even less grave than in the ordinary conditions of life. Not one case of 17, of typhoid fever supervening a few days after delivery, proved fatal. The same remark is made by M. Fauvel, who did not witness a single death in the cases of the lying-in women who had the disease. Although the cases are too few to warrant a definite conclusion from them, they seemed to me of sufficient interest to be recorded.

2. *Pneumonia* is, without doubt, of all the acute inflammations of the envelopes or of the parenchyma of the organs, one of the most likely to produce abortion or premature labor. M. Grisolle has himself observed 4 cases of pneumonia in pregnancy, and collected the details of 11 others. Of these 15 women, 10 had not reached the sixth month, and 4 aborted the fourth, fifth, sixth, and ninth days from the commencement of the attack. In 3 cases, the abortion was followed by disease of the lungs of the severest character, all proving fatal three or four days after; only one, whose pneumonia was limited, recovered without serious

symptoms. The 6 who did not miscarry, died without exception during the progress of the disease.

Of the 5 women who had reached an advanced stage, 2 were seven months pregnant when attacked with pneumonia; one was delivered prematurely on the twelfth, and the other on the fifteenth day, both dying two days after. The 3 others were in their ninth month: 2 were delivered of living children on the seventh and eighth day of the disease; the other died undelivered on the fifth day.

From the preceding data it may be concluded, that abortion usually follows an attack of pneumonia during pregnancy. I think, says M. Grisolle, that its disastrous influence is explained by the importance of the organ affected, by the gravity of the disease, the intensity of the general reaction, and the numerous sympathetic disorders which it produces in all the functions, much rather than by the paroxysms of coughing.

That the pregnant condition exerts a most dangerous influence upon the disease is shown by the fact, that of 15 women 11 died, though the general state of health was apparently very favorable in most of them. The prognosis seems to be more discouraging before than after the seventh month. Finally, if it be allowable to conclude from so limited a number of facts, abortion, contrary to what we have seen in regard to variola, would appear to be rather favorable than otherwise, since of the 4 cases of miscarriage one recovered, whilst the 6 who did not abort, all died. This would seem to confirm the following proposition of Desormeaux, namely: Abortion, which occurs but too often in acute diseases, frequently leads to a favorable termination in inflammatory affections.

3. *Various Inflammatory Diseases.*—We have but very imperfect data by which to judge of the reciprocal influence of pregnancy and of other acute inflammations. The statements of authors in regard to it are limited to a few isolated and often contradictory facts, whose very restricted number allows no useful conclusion to be drawn from them.

Whatever be the acute affection from which the pregnant female suffers, the treatment does not differ materially from that which is proper under ordinary circumstances. So long as there remains a reasonable hope of saving the mother by the use of mild and innocent remedies, none other should be resorted to; but if the disease be dangerous, and demands more active but more efficient means, it should be treated as though the woman were not pregnant. Bleeding and purgation which have been reproached with a tendency to produce abortion, may doubtless have that effect; but it must not be forgotten that they are used here to combat an affection which is, of itself, a much more active cause of abortion, besides endangering the mother's life so seriously.

4. *Icterus.*—Though icterus appears to affect the pregnant condition unfavorably, it is not exactly true to say that it always arrests its progress and produces abortion, either as regards the severest or the lightest cases of the affection. I have seen several cases of simple jaundice which constituted but a slight indisposition, and in no degree affected the gestation. The contrary has, however, been the case in some instances, and the two following, quoted by M. Ozanam, seem to me to be evidently exceptional:

A young primiparous woman, five months gone, had been sick for five days with a very simple jaundice, when she entered the hospital; three days after, she miscarried. Another, seven months and a half pregnant, also aborted five days after the commencement of a simple icterus. Neither of the children presented a yellow hue. Both mothers recovered.

The life of the child is greatly endangered by its premature expulsion, though it is rarely affected with the mother's disease. In none of the cases which have come under my notice did the fœtus present an icteric hue, although the amniotic fluid was more or less colored. J. P. Frank, however, relates the case of an icteric female who was delivered of a jaundiced child.

It is rarely that what is described as the grave form of essential icterus does not determine abortion, and it is also rare for the latter not to be followed by the death of the mother. Thus, out of the five cases reported by Dr. Kerksig, in the account of the epidemic which occurred in 1794, there were four deaths. M. Ozanam relates the case of a woman six months pregnant who died before miscarrying; and my friend, Dr. Fournier, has quite recently had a case of abortion followed by death.

[Churchill quotes the following account by Dr. Saint-Vel of an epidemic of jaundice in the island of Martinique in 1858.

"This icterus, which presented all the characters of an essential disease, surprised the medical men by its epidemic character, and its gravity in pregnant women, and in them only. It began at Saint-Pierre about the middle of April, reached its height in June and July, and having gone through the colony, ended with some isolated cases toward the close of the year.

"Attacking the various races of which the population consists, the white as well as the negro and the Indian coolie, the European as well as the Creole, it seemed to prefer adults, and was unattended with affection of the liver. When pregnancy did not exist, its termination was almost invariably favorable. The only victims were women, amongst whom were three young females not pregnant, and a woman of sixty-three years of age. In these it was always of a grave character, always the same, always mortal, and always accompanied by coma.

"Of thirty pregnant women attacked at Saint-Pierre, only ten reached term with no other symptoms than those of essential icterus. The remaining twenty died comatose after abortion or premature delivery.

"In the gravest cases in pregnant women the disease always pursued the same course. It always had the essential form, and was often light, until the occurrence of abortion or premature delivery, which never took place before the jaundice appeared. They were generally brought about by the latter after it had existed for two, or, less frequently, three weeks. Until coma appeared, the symptoms had no apparent gravity, nor presented anything peculiar. The coma preceded or followed the abortion or labor by a few hours, in two cases only coming on three days after.

"The women who died had reached the fourth, fifth, sixth, seventh, and eighth months of gestation. The coma was, in rare cases, preceded by a slight delirium, it never for a moment disappeared, but grew more and more profound until death occurred. It lasted but for a few hours, though in two cases it continued for twenty-four and thirty-six hours. Until it came on there was nothing special to be observed in regard to the general sensibility, respiration, or circulation. The pulse was not quickened, nor had it that slowness which is sometimes observed in cases of jaundice. None of the other features of grave attacks of icterus, not even uterine hemorrhage, were observed. With perhaps one exception, the women who died had no hemorrhage after delivery, and when death occurred three or four days subsequently, the lochia were of a normal character.

"Almost all the children were still-born, a few only living for a few hours, whilst but one survived and is still living. None of them were jaundiced, nor had any of the ten other children born at term of jaundiced mothers any sign of the disease." (Saint-Vel, *Gazette des Hopitaux*, November 20, 1862.)

On the other hand, Dr. Bardinet read in 1863 an account of a grave epidemic of icterus which prevailed in Limoges from the month of October, 1859, to March, 1860. In 13 women observed by him the pregnancy followed its regular course in 5 cases which were delivered safely at the ninth month. In 5 others the disease was followed either by abortion or premature labor. In the remaining 3 the icterus assumed a grave form with ataxic symptoms followed by coma, and both mothers and children soon perished.

Both multiparæ and primiparæ were attacked by the disease, but all had passed the fifth month of gestation.*

Dr. Bardinet recapitulates as follows:

1. Icterus may appear as an epidemic amongst pregnant women.
2. It then assumes three different forms, viz.:

* H. Blot, *Bulletin de l'Académie de Médecine*, October, 1864.

a. In the first it is simple or benign in character, and allows the pregnancy to progress favorably to term.

b. In the second it assumes the first degree of malignity, forming what might be called *abortive jaundice*, and occasioning either abortion or premature delivery without other unfavorable consequences.

c. In the third it assumes all the characters of the grave form of icterus, producing ataxic symptoms and coma, which soon terminate the lives of both mother and child.

H. Blot, in the excellent report from which I have quoted the preceding facts, relates a severe case of icterus observed by him at the Hospital of the Clinique. The patient died, and at the autopsy ecchymoses were found beneath the skin, and on the surface of the brain, of the heart, of the lungs, and of the intestinal canal. The liver was small, and of a deep-brown color, without yellowish spots. Microscopic examination showed that the tissue of the latter organ was destitute of a single trace of an hepatic cell. All the preparations showed merely fat globules in abundance mixed with biliary matter.

The cause of grave icterus during pregnancy remains unknown. I am disposed, however, to believe with M. Blot that it is due to changes in the liver, which I described long ago as occurring in pregnant women.

In regard to treatment, we are obliged to admit the inefficiency of all measures employed up to the present time. Premature labor or abortion would probably be more injurious than useful. As to prophylaxis, we should not hesitate in case of the occurrence of epidemic jaundice, to advise pregnant women to change their place of residence.]

5. *Syphilis*.—Syphilis may have the most disastrous effect upon the course of gestation, being a very frequent cause of abortion, and especially of premature labor. Its mode of action is various: sometimes, for example, the mother is in such a cachectic condition as to be unable to provide the fœtus with the material required for its development, her enfeebled constitution leaving the work incomplete; most generally, however, the health of the mother is not sensibly altered, and the action of the poison seems to be directed upon the fœtus only. In most cases, indeed, the disease does not disturb the natural course of gestation, but attacks gravely the health of the fœtus. Nothing is more common than for the latter to perish at more or less advanced periods, and be expelled prematurely. In these instances, numerous visceral lesions are discovered at the autopsy: sometimes it is an abscess of the thymus gland (P. Dubois); sometimes purulent collections in the lungs (Depaul); sometimes, again, is found that singular alteration of the liver so well described of late by M. Gubler, or those traces of peritoneal inflammation and sero-purulent effusions pointed out by Dr. Simpson as due to the same cause. Neither is it rare to find numerous bullæ of pemphigus upon various parts of the body of the child, especially upon the soles of the feet and the palms of the hands. For further details, see *Diseases of the Fœtus*.

Cases such as we have just mentioned are, unfortunately, but too common; it is not, however, to be understood that every child born of infected parents must necessarily suffer all the consequences. We even insist that such is not the most frequent result, for considering the large number of parents who are diseased, or who have been, the syphilitic lesions of new-born children would be much more frequent than is really the case.

M. Legendre, in discussing the question of the latent condition of syphilis in the parents, and of its influence upon the health of the child, arrives at a denial of this influence in the majority of cases.

Of the 63 patients who came under my observation, he says, there were 14, who had altogether 68 children, during the period intervening between the disappearance of the primary symptoms and the development of the venereal eruption. Of this number, 35 died without ever having had an eruption upon the body. The mean of the ages of these children at death was 7 years; the extremes being 6 months and 22 years.

All the 33 surviving children enjoyed good health, the mean of their ages being 17 years; the extremes 1 year and 38 years.

[Inasmuch as it is said that syphilis may be transmitted by either parent, it is far more probable that it should be when both are diseased. We will examine successively the first two conditions.

A. *Transmission by the father*.—The father only being syphilitic, can he communicate his disease to the child? The question is, at present, much disputed, for although the affirmative is maintained by Trousseau, Diday, Depaul, and Bourgeois, a directly opposite opinion is arrived at by Cullerier, who bases his view upon the observation of healthy children whose fathers were syphilitic, but whose mothers were not. He believes that inherited syphilis is always derived from the mother, the father having nothing to do with it. The same doctrine is taught in the memoirs of Notta and Charrier, and our colleague, M. Follin (*Traité de Pathologie Externe*), has observed six cases favorable thereto.

It is not easy, therefore, to decide the question. For our own part, we think that although the transmission of syphilis from the father to the child can hardly be denied in some cases at least, it is certainly less common than has been supposed.

B. *Transmission by the mother*.—This cannot be doubted. Two cases, however, present themselves: the mother may be syphilitic from the period of conception, or she may not have contracted the disease until after she became pregnant. In the first case there is no dispute as regards the fact of infection, but the unanimity ceases in the second case, when the question arises at what period of gestation the mother must be infected in order that it should be possible for her to transmit the disease to the fœtus. Cullerier thinks that it may occur at any time during pregnancy, whilst Ricord would restrict the possibility to the end of the sixth month, and Abernethy the seventh.

The opinion which would attribute to the use of mercury the effect due to the action of syphilis is both false and dangerous. The observations of M. Dunal have shown that syphilitic women who had never been treated, or, if so, in an imperfect manner, either aborted or were delivered prematurely of still-born or infected children which died: with those, however, who had the constitutional disease and were treated by mercury, the success was complete in many instances in respect both to mother and child.

6. *Saturnine intoxication*.—Women exposed to lead poisoning are very liable to abort. A former hospital interne, Dr. Constantine Paul (*Archives Générales de Médecine*, May, 1860), made a study of the effects of this action during gestation. He observed, in 1859, the case of a woman who had been three times safely delivered before being exposed to the influence of lead, and who afterward, out of ten pregnancies, had eight miscarriages, one child still-born, and but one delivered at term, but which died five months afterward. Struck by the observation, M. Paul thought that this great mortality might be due to the action of lead. The woman also informed him that almost all her companions in the establishment in which she worked either miscarried or were unable to raise their children. Then it was that he began his investigations.

M. Paul found 81 cases of women in whom saturnine intoxication occasioned either the death of the fœtus or the premature death of the child after birth; also miscarriages at from 3 to 6 months, and premature labors in which the children were born either dead or in a dying condition.

Out of a first series of observations, 4 women afforded a total of 15 pregnancies, in which there were 10 abortions, 2 premature labors, 1 still-born child, 1 which died within twenty-four hours, and 1 only which survived.

A second set of cases comprises the history of women who had been safely delivered before exposure to the influence of lead, but whose children afterward suffered from its effects.

Another set shows the alteration of results according as the woman gave up or resumed her occupation on several different occasions.

A final series proves that the fœtus may die of lead poisoning,

even though the mother may have had no symptom of the intoxication.

To recapitulate. Out of 123 pregnancies there were 64 abortions, 4 premature labors, 5 still-born children, 20 which died within the first year, 8 in the second, 7 in the third, and 1 death at a later period, 14 living children, of whom 10 only were more than three years old.]

7. *Phthisis.*—Most authors, in writing upon this disease, have given currency to the idea that its progress is arrested by the occurrence of pregnancy, but that immediately after delivery the pulmonary affection advanced rapidly to a fatal termination.

In a work read lately before the Academy of Medicine, M. Grisolle has endeavored to determine the reciprocal influence of these two conditions, and in so doing has arrived at somewhat different conclusions from those which had been received as a general expression of the truth. We think it right to give a brief analysis of this memoir.

Of seventeen cases collected by M. Grisolle, and ten others furnished him by M. Louis, twenty-four were those of women attacked with the disease during pregnancy, at periods not far removed from its commencement; the three others had reference to individuals who presented the rational signs of tuberculosis at the time of conception, but in whom the disease became well marked only at a later period.

In none of these cases was the pulmonary affection arrested, nor did it fail to progress quite rapidly. The symptoms peculiar to tuberculosis, whether local or general, were developed with the same order, the same regularity, and the same constancy as in the ordinary conditions of life. But, on the other hand, contrary to what might have been expected, the pregnant condition neither aggravated, nor rendered more frequent, the accidents of the disease; bronchial hemorrhage was noticed as being even rather less frequent than usual.

The entire duration of the phthisis in 13 women who were followed to the end was rather shortened than otherwise. Thus, in all of them it lasted on an average of nine months and a half, which is a figure more than a third less than that which expresses its duration for women of the same age, but not pregnant.

Pregnancy has not, therefore, the power of suspending phthisis, which has been supposed. But is it true, as is generally believed, that labor, and the puerperal condition, give to the process of tuberculization such an unusual impulse as to make it prove fatal in a very short time? The facts appealed to by M. Grisolle invalidate this opinion also. Thus, 12 women, in whom the disease had reached the second, and in most of them the third degree, at the time of delivery, resisted its inroads for four months on an average; and in all, the symptoms followed the progression that is usually observed. In 10 others, in whom the affection was in the first degree, or at the beginning of the second, at the period of delivery, the pulmonary lesion was found in 3 to advance slowly; in two only did it exhibit a notable aggravation; whilst in 5, or one-half the number, there was a considerable amelioration both of the general health and local symptoms, without, however, encouraging the hope of a cure, or of a long suspension of the disease.

Does phthisis exert an unfavorable influence upon the progress of gestation? In this point of view, it may at least be regarded as much less serious than pneumonia. Thus, of 22 women, only 3 aborted in the fourth and sixth months, 3 were delivered prematurely about the eighth month, whilst all the others reached their full time; however, in nearly two-thirds of the latter, the pulmonary disease commenced in the early months of gestation, passed through all its phases, and produced a deep-seated cachexia.

With one exception, delivery was accomplished after four or five hours of suffering, which is explained rather by the relaxation and want of resistance of the soft parts, than by the small size of the children. Although the latter were generally feeble and emaciated, yet in more than a quarter of the number the tissues were firm, the form rounded, and of an embonpoint contrasting remarkably with the reduced condition of the mother.

In all the patients, except those who were in the last stages of consumption, and who died a few days or weeks after delivery, milk was secreted, and in the majority of cases so abundantly, that it was impossible to prevent them from nursing the children.

The flow of milk, however, lessened, or even ceased, within a period varying from one to four weeks; and even this short-lived lactation was always accompanied by a sensible aggravation of the disease, and had the most disastrous effects upon the children; for they died shortly after of softening of the intestinal mucous membrane.

From a very interesting memoir upon the same subject, by M. Dubrueilh, of Bordeaux, it appears that the result of his observations has been nearly the same.

In short, neither pregnancy nor delivery affect the progress of phthisis; nor does the latter disturb sensibly the course of the former.

8. *Hysteria; Epilepsy; Chlorosis.*—Some physicians have imagined that the occurrence of pregnancy might exert a favorable influence upon hysteria or epilepsy, either by suspending the attacks during the continuance of gestation, or even by ridding the patients of these affections entirely. Unfortunately these hopes have not been realized by experience; for although the convulsive attacks have seemed in some cases to be less frequent, or have even ceased entirely, in others they have occurred much oftener than before. M. Malgaigne mentions a remarkable case in which the first epileptic attack came on during pregnancy in an unfortunate female who had never before been affected with it, and who retained it throughout her future life.

Marriage, and the consequent pregnancy, have often been recommended as the best means of curing chlorosis. When this disease appears to have been produced by disappointed love, the cause may, indeed, be thus removed, and the remedies directed against it rendered more efficacious. Pregnancy may, in this way, regulate the uterine functions for the future, cure the dysmenorrhœa, and consequently have a favorable effect when the irregular or difficult menstruation was the cause of the chlorosis. Under all other circumstances, however, pregnancy has seemed to me to aggravate the chlorotic symptoms. I, therefore, think it most prudent to defer marriage until after the general health of the patient is improved.

§ 5. Surgical Diseases.

1. The pregnant condition often has a favorable effect upon scrofulous ulcers. Under the influence which it exerts upon the entire organism, glandular engorgements sometimes disappear, diseases of the bones are modified favorably, ulcers become clean and covered with bright, firm granulations, and cicatrization follows.

In many cases, it has appeared to arrest the consolidation of fractures. A curious instance of the kind is mentioned by Alanson. A woman broke her tibia when in the second month of her pregnancy, and during the seven succeeding months, the solidification made no progress. Nine weeks after delivery, the callus was strong enough to admit of walking. As proving that no constitutional depravation could be adduced in explanation of the retarded cure, he adds, that three months before impregnation, she had recovered rapidly from a fractured thigh. My friend, Dr. Fournier, cites three analogous cases from Dupuytren's Clinic. In all three, there was no consolidation before delivery, though it took place rapidly afterward. Though other similar instances are on record, it must be acknowledged that there is also a considerable number in which recovery did not seem to be delayed by the pregnant condition.

2. *Serious operations* have several times been performed during gestation without producing abortion, whilst in other cases they have had this result. From these opposite facts, I think it fair to conclude that none but urgent operations should be performed, and that all others, such as fistula in ano, for example, which do not endanger the life of either mother or child, should be deferred to another time.

3. *Tumors in the Abdomen and Pelvis.*—Most authors think that

tumors in the abdomen and pelvis during pregnancy have no other effect than to impede mechanically the development of the uterus, or to present an obstacle to the delivery. (See *Dystocia.*) Sometimes, however, they assert, they may give rise to abortion or premature delivery, though, generally, they are not otherwise dangerous.

That this complication is of no danger, independent of the risk of abortion which it may occasion, cannot be admitted in an absolute sense. Dr. Ashwell has remarked, in his excellent work, that the uterus, when developed until term, exerts a strong compressing force upon the pathological tumor; that this compression may give rise to an inflammation ending sometimes in suppuration at the centre of the diseased mass, at others, in a rapid increase of the tumor immediately after delivery. I have several times had the opportunity of verifying the accuracy of these statements. Death may occur in a short time, as the consequence of this inflammation or rapid enlargement, and the autopsy has several times exhibited the uterus in a perfectly healthy state, together with the more or less extensive alteration of the pathological tumor.

Deeply impressed by the cases of this kind which he had occasion to observe, Dr. Ashwell asks, whether the development of the uterus, and the pressure which it exerts upon the neighboring tumor, are not the causes of the pathological changes of the latter, and consequently whether the induction of premature labor would not be the surest means of guarding against the dangers to which the female is so often exposed in these cases, even after having overcome all the difficulties of labor. When treating hereafter of premature labor, we shall have occasion to criticise the affirmative decision which he has come to; but we have thought it right to direct attention to a peculiarity but little known in the history of the tumors which complicate pregnancy.

4. *Intra-parietal fibrous tumors*, or those developed in the substance of the walls of the uterus, may exert an injurious influence upon the course of gestation, and become a cause of abortion when they are of large size; though, generally, they have no effect whatever when small. In the latter case, the physiological evolution of pregnancy may accelerate wonderfully the increase of the pathological tumor. The usually slow growth of these intra-parietal tumors is well known; now I have known them in several instances to acquire a size in the first three or four months, which they would not have done in several years in the non-pregnant condition. Developed as they are in the midst of the uterine fibres, they participate in the increased vitality with which the latter are endowed during gestation; and, like them, they undergo a considerable hypertrophy.

In some cases I have seen this hypertrophy of the morbid tumor continue, and even increase after delivery; but in others, the latter event was followed by a notable diminution of the size of the tumor, which gradually grew less as the womb resumed its normal condition, finally attaining the size which it had before conception. In one case, observed in 1852, this process of absorption went on, and the tumor disappeared.

[§ 6. Hypertrophy of the Thyroid Gland.

It is by no means rare for the thyroid gland to undergo hypertrophy during gestation apart from any endemic influence. The enlargement is generally slight and gives no trouble, though some women complain that their necks become large and unsightly. The swelling diminishes somewhat after delivery, though it rarely disappears entirely.

I knew one case in which the hypertrophied gland inflamed and suppurated, giving rise to an abscess which discharged for a long time; nor was the cure complete until after the lapse of several months.

Although this hypertrophy of the thyroid gland in pregnant women is not usually dangerous, it may in some very rare cases imperil the life of the patient. Two instances of this kind are related by M. N. Guillot. The first was that of a lady who was surprised during her first pregnancy to find that the front of her neck was gradually enlarging. When again pregnant, the swelling increased and became uncomfortable; still, the delivery was favorable, and she nursed the child for fourteen months. The gland, however, continued to enlarge, respiration became painful, and finally the symptoms were so threatening that tracheotomy was performed. The patient died.

In the second case, the hypertrophy also appeared during the first pregnancy and increased during the succeeding one, so that nineteen months after the second delivery it formed a tumor of about eight inches in circumference.

The breathing was obstructed, slow, and whistling, during both expiration and inspiration, and the voice was broken and painful. Paroxysms of suffocation came on, during one of which the patient died. At the autopsy the trachea was found to be flattened and the pneumogastric nerves compressed.

I witnessed for myself a similar case at the hospital of the Clinique in 1861. A woman, who for a long time had a goitre, found the tumor to increase rapidly in size during her first pregnancy. At the sixth month, respiration had become very difficult, and attacks of suffocation brought her to the hospital. By the end of the eighth month the symptoms were so severe that premature labor had to be induced, but the patient died in an attack of suffocation a few hours after delivery. My friend, Dr. Tillaux, then prosector of the Faculty, dissected the tumor and found the trachea compressed by the enlarged gland.]

§ 7. Ulcerations of the Neck of the Uterus.

It is rarely that cancerous affections of the neck of the womb seem to disturb the course of gestation, and the impediments which they but too often present during labor prove sufficiently that they are rarely a cause of miscarriage. On the other hand, I have never observed that the increase or degeneration of these tumors was sensibly hastened during gestation. Therefore, I shall treat no further here of this subject, reserving its discussion for the article on tedious labor; but propose to speak briefly of ulcerations of the neck during pregnancy.

It has been but a short time since surgeons have used the speculum in the cases of pregnant women. A just fear of the mischievous effect which might follow its repeated introduction prevented them from obtaining a correct idea of the condition of the neck at the various stages of pregnancy. These fears were, however, somewhat exaggerated, for, if introduced carefully, the speculum never causes serious accidents. In all cases, the instrument with two or four valves is, in my opinion, the best.

In default of great experience, there is considerable difficulty, no matter what instrument be used, in engaging the cervix in the extremity of the speculum, unless the situation of the neck is first ascertained by the touch. This difficulty is known to result from the fact of the direction of the cervix toward the anterior surface of the sacrum.

The engagement once effected, it is only necessary to separate the valves of the instrument slightly in order to bring the os tincæ into view.

As the touch should have led to anticipate, the changes which the eye detects in the intra-vaginal portion of the neck are very different in the primiparous female from what they are in one who has had children; we would also add, that the appearance is far from identical at the beginning and termination of pregnancy.

As seen in the latter third of gestation, the neck is generally of a deep violet-red color; and, if it be a first pregnancy, is usually quite smooth throughout its extent; the external orifice is ordinarily more or less rounded, and though larger than in the unimpregnated condition, it barely permits the sight to penetrate its cavity, even though the valves of the instrument be separated considerably. The circumference of the external orifice and the free portion of the neck rarely exhibit signs of ulceration, though it is quite common to observe a series of granulations of a cherry-red color, of sizes varying from that of a large pea to that of a pin's head. These species of vegetations bleed upon the slightest touch with the cotton used for wiping them.

In the female who has had several children, the neck is usually

much less voluminous, and it is somewhat difficult to include it entirely in the speculum. The lips of the os tincæ seem divided in several portions, a sort of segmentation caused by the ruptures which occurred in the preceding labors, and which give to the orifice considerable irregularity. In consequence of these numerous solutions of continuity, the opening is much larger, and is dilated with great facility, provided the valves be separated, thus allowing the eye to explore the cavity with readiness.

The walls of this cavity are very unequal, frequently presenting an uninterrupted series of fungous projections, separated by depressions of variable depth. Some of these projections are transparent, being formed probably by hypertrophied follicles; others resemble soft vegetations. The latter are generally covered by an intact epithelium, so that they may be touched without being made to bleed; again, what is by no means rare, they seem destitute of this external covering, and bleed upon the slightest touch.

It is more especially in the furrows which separate these, that linear ulcerations of variable depth are discoverable. These ulcerations sometimes extend over a considerable surface, and are then readily perceived, though they are usually concealed in the depth of the anfractuosities, and, in order to see them, it is necessary, after a thorough cleansing, to unfold the neck, as it were, by expanding the speculum considerably.

According to MM. Gosselin, Danyau, and Costilhes, these linear ulcerations are much less frequent than I had supposed, and are met with in barely more than half the cases, whilst I had observed them in seven-eighths. However, as I stated very plainly, I intended to be understood as speaking only of multiparæ who had reached the latter months, whilst M. Gosselin includes in his statement all stages of pregnancy, and M. Danyau does not appear to have distinguished primiparæ from multiparæ.

Must we admit that, as M. Huguier supposes, we have been deceived? According to this gentleman, a muco-pus of variable consistence is frequently deposited in and adheres closely to the bottom of the furrows observed on the internal surface of the neck. This matter bears a complete resemblance to the bottom of an ulcer; but efface the folds and wipe them well, and the supposed ulcerations disappear. . . . . It is difficult for us to believe that we have been so deceived; still, the assertion of M. Huguier merits serious attention, and shall receive it hereafter.

Unless my observations have been for a long time subject to a series of singular coincidences, it is probable that what we have just described is the normal condition, and should not be regarded as pathological, but simply as a consequence of the progress of gestation. As the violet-red color, the swelling, the softening, and the almost fungous condition of the walls of the neck, are peculiar to pregnancy, and in nowise interfere with its progress, so I regard the ulcerations as a consequence of a physiological process, extreme in degree, and of no greater importance than the other physiological changes.

Especially am I convinced of their non-injurious character, and therefore regard all treatment employed against these ulcerations, even when *fungoid*, as much more hurtful than useful. I say, even *fungoid;* for, contrary to the opinion of M. Coffin, who attributes a great prognostic value to this character of the ulceration, I think that they are fungoid, not because they have a natural tendency to become so, but because the tissue which they affect always presents at a certain period the color and consistence of fungous tissue.

If, therefore, I am not deceived, and if the peculiarities just described really form a part of the pregnant condition, and are merely an exaggeration of the changes which the structure and vascularity of the walls of the uterus undergo at this period, the condition should disappear with the cause which produced it. Like the vomitings, varices, hemorrhoids, and other sympathetic disorders of pregnancy, it should disappear with it. Now this is exactly what happens, and it may be regarded as a principle, that no traces of it remain two months after delivery. The non-specific ulcerations sometimes met with in recently delivered women are of different appearance, and have their origin, in my opinion, in the non-cicatrization of the ruptures which took place during labor.

In short, therefore, the fungous condition of the neck, and the ulcerations of greater or lesser depth which complicate this state of the parts near the termination of pregnancy, seem to me to be the consequence of the active or passive congestion with which the organ is affected. I think that, except in a few rare instances marked by specificity of character, or strong tendency to spread—a tendency, by the way, which I have never observed—all local treatment should be refrained from.

Is the case the same at a less advanced period, and are the ulcerations which may affect the neck in the early months of an equally innoxious character?

MM. Boys de Loury, Costilhes, Coffin, and Bennett, who have directed their attention more particularly to the ulcerations occurring in the first half of gestation, have been so forcibly struck with their tendency to produce abortion and puerperal diseases that they class them with the most common causes of miscarriage. Mr. Bennett goes so far as to call them the *keystone* of all diseases of the pregnant female, and the most frequent cause of difficult labors, obstinate vomiting (see page 62), moles, abortion, and hemorrhage.

Notwithstanding the smallness of their number, the observations which I have been able to make differ so completely from the results obtained by these gentlemen, that I was tempted to accuse them of some exaggeration. However, after having heard MM. Huguier, Gosselin, Danyau, Cloquet, etc., proclaim the innocence of these ulcerations, I have no hesitation in saying that they have misconstrued the facts observed by them. Finally, we would add, that after having read their observations, there seemed reason for inquiring whether, in many cases, syphilis may not have been the principal cause of the accidents, and in others, whether the frequent introduction of the speculum and the numerous cauterizations which had been practised, may not have played the most important part in the production of the abortions.

I ought, perhaps, to except the peculiar species of ulceration described by my friend M. Richet. All the varieties of ulceration, says this learned surgeon, which are observed in non-pregnant women, may occur during pregnancy; but it has seemed to me that they had a tendency in some cases to assume a fungous character, to excavate the lips of the cervix, to bleed readily, and give rise to serious accidents: abortion, for example. In all my patients, these ulcerations with well-defined edges, and red and bleeding bottoms, were covered with reddish fungosities, which projected between the partly opened lips of the cervix. Of six patients, four miscarried, and two left the hospital apparently cured; of the four who aborted, one only had been cauterized, the three others not having undergone any treatment.

Whoever, like myself, has examined women at the end of gestation, will find the ulcerations observed by M. Richet in the early months, and which he has had the kindness to show me, to bear a close resemblance to those sometimes met with in the latter stages. I see no difference except in the rather greater extent of the ulceration. Their size leads me to suppose that their origin dates back long before impregnation, and their sharp, well-defined edges excite a suspicion of their being specific in character (five of these six women had syphilis at the time, or had previously been affected with it). Now we may readily conceive that under such circumstances the softening, congestion, and fungous condition which pregnancy usually produces at an advanced period, may here take place prematurely, and give to the ulcerated tissues the livid hue and fungous aspect described by M. Richet. Thus we may understand how such an affection of the cervix, connected most frequently with a general disorder, under whose influence it has a constant tendency to increase, may ultimately give rise to abortion. It also seems to me important to distinguish the ulcerations which existed before pregnancy, and continued, and even increased after conception, from those which were developed after the formation of the germ: the former in consequence of the irri-

tation which they may suffer as a consequence of fatigue and especially of too frequent coition, might readily excite the contractility of the uterus and occasion miscarriage; the latter, on the contrary, should, it seems to me, rarely exert such an influence.

I agree, therefore, with the opinion of M. Richet, that when an ulceration presents in the first half of gestation, possessing the characters which he describes, and which, in my opinion, are an evidence of its chronicity, miscarriage should be anticipated, and means be taken to prevent it. Now, aside from a specific treatment in those cases which indicate it, I may be allowed to ask of those who would have these ulcerations treated as a matter of necessity, what are the best local means to be used? Which caustic is preferable? Is not the solid nitrate of silver accused of producing abortion by the partisans of the caustic of Filhos, of the acid nitrate of mercury, or of the actual cautery; and has not each of these latter means also been reproached with giving rise to miscarriage? The thesis of M. Coffin affords some curious details on this subject, and evidently proves, that though cauterization by any agent whatever may claim some doubtful successes, the latter are generally compromised by the abortions which have followed it. From the statements of Bennett and Boys de Loury, the same inference follows. M. Coffin himself, though attributing such great importance to these ulcerations, arrives at this discouraging *therapeutic conclusion*, viz., thus far, no treatment has succeeded, and the question remains open. This, which was true in 1851, is so still; for quite recently we heard M. Chassaignac speak emphatically of the inefficiency of all methods, and M. Richet declares himself undecided as to the best course to pursue.

The insufficiency of local treatment, and the mischievous effect which it may have upon the progress of gestation, should, it seems to me, in the present condition of science, lead us to dispense with it whenever the ulceration has no marked tendency to invade a large extent of the cervix.

CHAPTER X.

DISEASES OF PREGNANCY.

Those who have studied the various affections of the womb are well aware that its diseases excite numerous sympathetic disorders. The commencement of the physiological acts which devolve upon it, and their periodical fulfilment, exert upon the functions of the alimentary canal, and upon those of the nervous system, an influence which has for a long time attracted the attention of practitioners. It were useless to mention all the morbid phenomena which so often precede, accompany, and follow the first menstruation. These are more striking when the latter is postponed or difficult. In some individuals they appear at each menstrual period for a long time, thus seeming to show an impossibility on the part of the organ to perform its functions, without occasioning extensive disturbances of the economy; and it is only, so to speak, when the sensibility of the womb has been blunted by habit, that the return of the menses ceases to produce the general disorders which accompanied it previously.

If the diseases of the organ, and even the simple monthly congestion, are capable of giving rise to such troubles, it is easy to foresee that pregnancy, which changes simultaneously the form, size, and even the structure of the uterus, can hardly pass through its various periods without deeply affecting all the functions.

The effects produced by the pregnant condition vary greatly, as regards both the degree and the nature of the symptoms; all of them being influenced by the constitution of the female. Occasionally, it results in a salutary change in the entire system, better health being then enjoyed than at any other period. In the majority of cases, however, tiresome, or at least very disagreeable symptoms are experienced, which are the expression of the unpleasant influence exerted by the uterus upon important functions. These troubles, which are so slight in some individuals as to amount merely to discomforts, are, in other cases, so great as to injure their health, and even to excite fears for their existence.

These accidents may appear at almost any time; for though some persons begin to suffer at the very outset, and are relieved by the third, fourth, or fifth month, others are attacked only in the latter half of gestation.

The pregnant condition operates differently at the different periods of gestation, in the production of the accompanying discomforts or diseases; this fact, which is important in a therapeutical point of view, was felt vaguely to be so by Burns, but clearly expressed by M. Beau, who, I think, has thrown much light upon the pathology of pregnancy.

Most of the functional disturbances may occur in the early, as well as in the latter months. At first they were regarded as the result of the numerous sympathies existing between the uterus and the digestive apparatus, and, at a later period, the purely mechanical difficulties produced in the neighboring organs by the pressure of the uterine tumor were thought to assist in their production. Now, the pressure of the womb is of quite secondary importance, if, indeed, it be of any whatever; for, according to M. Beau, the following is what usually occurs: The womb, as modified by pregnancy, affects the digestive functions through sympathy, giving rise to the dyspeptic symptoms described hereafter. The disturbance of these results necessarily, if prolonged, in deficient nutrition, which, in a woman who is obliged to furnish the material for the development of the child, must soon occasion a greater or less diminution of the blood corpuscles, and a considerable increase of the serum; in short, to all the anatomical characteristics of chlorosis or polyæmia.

Now, this impoverishment of the blood soon occasions new morbid symptoms in the pregnant woman, as well as in the young chlorotic female, and so serves to explain the reappearance of the disorders of digestion, vertigoes, headaches, congestions of the face, palpitations, and difficult respiration, so frequently observed at an advanced period of pregnancy. We thus see that the functional disorders, which at the outset are purely sympathetic, become afterward intimately connected with the chlorosis which they themselves helped to produce. (See *Disorders of the Circulation.*) Though we shall have occasion to treat hereafter of this latter etiological peculiarity, we cannot help calling attention, at present, to the importance of taking it into consideration in the choice of remedial measures. For, though it be proper at the commencement to reduce the over-excitement of the uterus, and the sympathetic irritation produced by it in other organs, by soothing remedies, as baths, mild laxatives, antispasmodics, and sometimes even by moderate blood-letting, an entirely different course should be pursued toward the end of gestation. All the restorative agents, as iron, animal food, and tonic wines, are here the surest means of opposing the plethora and removing the disorders which it occasions. Still it is right to observe, that beside the chlorosis, which

plays the principal part in the production of the disorders of the latter months, the uterus still retains its sympathetic influence, and is subject at all times to congestions, which increase its irritability, and cause it to react upon other organs; of all which account should be taken in the treatment. The subject will claim attention hereafter.

Finally, the connection which we have endeavored to demonstrate as existing between the sympathetic troubles of the beginning of pregnancy and the chlorosis of the latter months, cannot always be readily discovered. The sympathetic influence of the uterus upon the digestive functions is not always manifested by vomitings, nausea, and strange and depraved appetites. All these symptoms may be wanting, and yet the stomach fail to perform its functions with its normal regularity. Nutrition may be disordered, giving rise to a dyspepsia, which M. Beau proposes to distinguish as *latent;* a dyspepsia which cannot fail to occasion eventually a general deterioration of the blood. Exactly the same thing occurs in young girls whose menstruation is either difficult, irregular, or imperfect. Confirmed chlorosis is always preceded in them by sympathetic disorders of digestion; though sometimes the deranged function is evinced by very marked symptoms, at others it is hardly a cause of discomfort.

Desormeaux, in his excellent article on this subject, ranges all the diseases of pregnancy under the following heads, viz.: lesions of digestion, of circulation, of respiration, of the secretions and excretions, of locomotion, and of the sensorial and intellectual functions. And we propose partly to adopt the same order in our description.

ARTICLE I.

LESIONS OF DIGESTION.

§ 1. Anorexia.

The want of appetite, or the disgust for aliments, which pregnant women are so often affected with towards the end of gestation, and still more frequently at its commencement, may be referred to various causes, and consequently will present different indications for treatment. When it seems to result merely from the sympathetic relations existing between the uterus and the organs of digestion, there is little or nothing to be done, for it would be in vain to attempt removing the disgust which some patients have to certain articles of food. In general, they dislike all meats, and this is an indication, or rather an obligation, to permit the use of vegetables in such cases. Again, if at an advanced stage, the anorexia be accompanied or preceded by the phenomena of general plethora, venesection, proportioned to the general condition of the female and the stage of pregnancy, may relieve it. Care, however, should be observed not to mistake the symptoms produced by anæmia for the indications of plethora; the former being far more effectually treated by ferruginous preparations. (See *Disorders of the Circulation.*)

In those cases which exhibit evident signs of an overloaded condition of the alimentary canal, some purgative, such as rhubarb, or even the neutral salts, may be administered. Indeed, certain authors have recommended an emetic, when there is any gastric distress; but I think practitioners ought to be very reserved in the employment of this last measure, since the shock of vomiting has often produced abortion.

§ 2. Pica, or Malacia; Pyrosis.

Pica, or malacia, frequently accompanies the affection just described. Pregnant women, like chlorotic girls, often have irregular and depraved longings for the most absurd or disgusting articles. For instance, I have known a young female to eat peppergrains almost continually. Another, at the Clinique, scraped the walls to appease her cravings for chalk; and M. Dubois often relates in his lectures the history of a young pregnant woman whose greatest pleasure consisted in eating small bits of well-charred wood. Again, they have been observed eating greedily substances that are still more disgusting. Unfortunately, all our persuasions are useless with such monomaniacs in the majority of instances, and consequently we must, as a general rule, grant them an indulgence, and avoid too strong an opposition, unless the coveted articles would evidently be injurious to their health.

I have but little to say of the acidity of stomach, of the spasmodic pains of that organ, and of the pyrosis and other symptoms of gastralgia, which are also quite frequent during pregnancy. The treatment of the symptom is here the same as under ordinary circumstances. Thus, for sour eructations and acidity of the primæ viæ, magnesia and the absorbents, bicarbonate of soda, the water and pastilles of Vichy, may be administered. Pyrosis and cramps of the stomach are usually treated successfully by powdered columbo, and most of the antispasmodics, in connection with small doses of opiates. The latter may also be used after the endermic method.

If, however, it be desired to attack the first cause of these gastralgic symptoms, it is important to remember that this is different for the first and second half of gestation, and that the measures employed should vary accordingly.

§ 3. Vomiting.

The vomiting of pregnancy presents two different forms. In the first it occasions discomfort and fatigue, without endangering life. In the second, it is sometimes so severe as to prove fatal. The first we shall term *simple vomiting;* the second, *grave* or *irrepressible vomiting.*

1. *Simple vomiting.*—This symptom is so common that most females are affected with it; in fact, vomiting frequently commences in the very earliest stages: whence many women, taught by their former pregnancies, recognize it as an almost certain sign of a new gestation. At other times it does not appear until toward the third or fourth month, though seldom later than that; but it is not at all uncommon to see it reappear near the end of pregnancy in some who had been previously tormented in this way at its beginning. As an ordinary rule, the vomiting only lasts six weeks or two months; sometimes, however, it extends over four or five months, rarely persisting throughout the whole term. Some females have the unenviable privilege of vomiting every time they are pregnant; others, more fortunate, pass through several gestations without feeling any digestive disorders whatever. It is a very remarkable fact, if we may rely on the testimony of numerous mothers, that the sex of the child is not wholly irrelevant to the production of this symptom; and however ridiculous this may appear at first sight, I have heard it repeated by so many women that I cannot refrain from believing that it, like most other popular prejudices, has some foundation.

But what is the cause of such vomiting? When it occurs near term, we may justly attribute it to the pressure, to the mechanical constraint which the uterus, whose fundus reaches the epigastric region, exercises upon the stomach; but in the early stages it is much more difficult to explain it unless we content ourselves by referring it to the numerous sympathies existing between the uterus and the stomach: sympathies so intimate that they are manifested in certain women at every menstrual period, and even in nearly all those afflicted with a disease of the womb.

Although the intimate nature of these sympathies is very obscure, we can admit them more readily in the etiology of vomiting than the influence of most of the anatomical causes adduced by some authors. In endeavoring to trace a relation of causality between the vomiting and an inflammation of the uterus, placenta, and membranes, like Dance; softening of the stomach and fatty degeneration of the liver, like Chomel; or, finally, to the existence of organic lesions of parts in the neighborhood of the uterus, observers have merely noticed simple coincidences, without throwing the least light upon the question of etiology. How often, indeed, is nothing of the kind discoverable!

I am persuaded, says Dr. Bennett, that those gastric disorders and obstinate vomitings, which so often bring women to the portals of the tomb, are almost always caused by inflammatory ulcerations of the neck of the womb. For my own part, he adds, since my attention has been directed to this subject, I

have *almost invariably* found ulceration of the neck in cases of this kind.

I cannot receive this opinion of the English accoucheur, at least as relating to the majority of cases, for I have frequently examined with the speculum each of four primiparous women affected with incorrigible vomiting, and in whom I ascertained the cervix to be perfectly healthy.

It has been said that primiparous women are more subject to vomiting than others, on account of the uterus yielding less readily to distension in first pregnancies.

Although this opinion is quite conformable to the theoretical views already given, the fact is, that it is liable to very frequent exceptions. Some multiparæ, who suffered very slight disorders of the stomach in their first pregnancies, have vomited almost constantly in later ones. The rigidity of the uterus is not, therefore, the only cause which is capable of sustaining an irritability of the organ which reacts sympathetically upon the stomach.

I do not think that an epidemic influence can be admitted as a cause of these vomitings.

The vomiting varies much as regards its frequency, intensity, and the greater or less ease with which it is accomplished.

Thus, some women vomit only upon awaking or rising in the morning. They then throw up some viscid or glairy matters, which are generally colored with a little bile, especially if the retchings have been very severe. Others vomit only after eating; occasionally after only one of the daily meals, but sometimes after all of them. Again, in some unfortunate cases it continues even in the intervals of the repasts; everything taken into the stomach, whether liquid or solid, being immediately rejected. There are cases, finally, in which the mere thought of food, or the sight or smell of it, is sufficient to provoke it.

The vomiting is sometimes easy, and causes little pain; it is indeed not uncommon to find ladies suddenly interrupted at their meals, who can return in a few minutes, and sit down and eat with a good appetite and pleasure.

In other cases, however, the ingestion of food is productive of pain in the stomach or inexpressible uneasiness of variable duration, and it is only after five or six hours of suffering, that the food is vomited and then found to be almost unchanged, notwithstanding its long retention in the stomach. In such cases the vomiting is preceded by such prolonged and violent retchings as to reduce the patient to a state of extreme suffering and agitation.

It is occasionally followed by considerable epigastric pain, which is increased by pressure, and might for a moment be taken as a sign of inflammation of the stomach; it gradually diminishes, however, and disappears entirely after a time. The shocks and violent efforts sometimes extend their influence to the hypogastrium, and give rise to abdominal pains and even uterine contractions, which may be active enough to produce abortion.

But it must not be supposed that vomiting, even when prolonged and oft repeated, is necessarily disastrous. No doubt many women waste away, but I have often satisfied myself that the emaciation is not apt to be excessive, by examining females who, according to their own expression, could retain nothing at all; and hence it is exceedingly probable that all the food taken by them is not rejected.

Burns states that he has never known vomiting depend on pregnancy alone to have a fatal termination. I might cite, says Desormeaux, examples of emesis accompanied by cruel pains and violent general spasms, yet the gestation has happily gone on to full term. At this time, I have myself under care a lady who has been vomiting throughout the whole period of gestation, and who has just been delivered of a daughter weighing seven pounds and three-quarters.

Finally, it must not be forgotten that in some cases which even appear serious, the vomiting may cease abruptly, either spontaneously, or because the sympathetic irritation of the uterus has been translated to some other organ, or again, as a consequence of a violent mental emotion. A remarkable instance of the latter has quite recently come under my notice. A young lady, two months and a half advanced in her pregnancy, had been tormented for three weeks with such obstinate vomiting, that, according to her own statement, the smallest mouthful of fluid excited it, and that she was unable to retain anything whatever in her stomach. All the remedies employed against it had proved useless. At this juncture, her husband fell suddenly and dangerously ill with symptoms of strangulation of the bowels, and from this time her vomiting ceased, nor did she suffer the least disturbance of her digestive functions afterwards.

I have been induced thus to hold forth from the outset a favorable prognosis, which indeed is true for the vast majority of cases, in order to relieve young practitioners from the anxiety which some recently published articles on the gravity of this affection are calculated to produce.

2. *Grave or Irrepressible Vomiting.*—The vomiting is not, generally, serious, but only painful and fatiguing to the mother; it must, however, be acknowledged that in some very rare cases, it is so violent and constant as to exhaust the strength of the patient in a few weeks, and after producing extreme emaciation terminate in death.

The display of symptoms given by M. Chomel in one of his clinical lessons, applies to these exceptional cases only. The disease, he says, is characterized by frequent bilious vomiting, an acid, fetid breath, and fever; then the brain becomes involved, and we have delirium, coma, and death.

The views of M. Dubois correspond closely with those of M. Chomel, and, like him, he describes three stages.

[A. *First Stage.*—The irrepressible form of vomiting rarely begins suddenly, but almost always follows insensibly the simple form. The time at which it commences is very variable. Generally appearing during the early months, it may not come on until after the middle of gestation. In 43 cases collected in the excellent thesis of M. Guéniot, hospital surgeon, and former chief of the lying-in hospital, and from which we shall borrow largely, vomiting occurred 9 times during the first weeks of pregnancy, 15 times toward the end of the first month, 9 times between the first and second months, 5 times between the second and third months, 1 time between the third and fourth months, 2 times between the fourth and fifth months, and 2 times between the sixth and seventh months. The first of the cases enumerated are of the early and benignant form, and it is impossible to distinguish accurately the period of transition from the simple to the graver form.

The irrepressible cases present in themselves nothing very characteristic. The vomiting, however, is very frequent, and occasions the rejection of all or nearly all the food and drink which the patient takes. The smallest quantity of fluid is often sufficient to excite it.

The dejections in these cases are composed of mucous or glairy matter, bile or food, according as the bowel happens to be full or empty. Generally they are very acid, and sometimes streaked with blood.

To these symptoms may be added a disgust for or aversion to food, so great as to be often insurmountable.

Soon appear the grave signs of insufficient nutrition: emaciation, debility, and altered features. Certain accessory phenomena may also complicate the situation, such as the almost constant ptyalism indicated by Stoltz and Vigla, and confirmed by an observation of my own.

The first stage is devoid of fever, unless it be a little febrile action in the evening and slight perspiration during the night. We invite attention to this fact, inasmuch as fever is the dominant symptom in the second stage.

B. *Second Stage.*—In this period the symptoms of the first stage grow more severe; the attacks of vomiting are more frequent and violent; the emaciation increases; finally, fever sets in with a pulse of from 100 to 140 per minute. The mouth becomes dry, the thirst is intense, the breath acid and fetid. The acidity and fetidity of the breath are such, says M. Chomel, as to strike one on

entering the room of the patient. Still, should we consult our personal experience, we should say the odor is uncommon, inasmuch as we have never observed it in the many cases of irrepressible vomiting which we have seen.

C. *Third Stage.*—In this stage the symptoms undergo a change, the attacks of vomiting ceasing or becoming less severe; but it is a deceitful calm which the experienced physician knows to be the prelude to death. There will, however, be no risk of deception if we but observe that the fever persists with a pulse of from 120 to 140 pulsations per minute. Attacks of syncope and cerebral symptoms soon come on. These are: intolerable neuralgic pains, disordered sight and hearing, hallucinations, delirium, and, finally, coma, which ends shortly in death.

D. *Progress. Duration, and Termination.*—The paroxysms of the grave form of vomiting often remit more or less completely; the remissions being sometimes, as it were, spontaneous, or in consequence of almost insignificant circumstances. Thus an emotion, travel, some change in the mode of life, a new article of food, and numerous similar eventualities seem occasionally to produce a transient amelioration, or even a momentary cessation of the symptoms. The hope thus excited is, unfortunately, but too soon destroyed by a more or less rapid recurrence of the disease. (Guéniot, *Thèse de Concours.*)

At other times these remissions may be attributed to the use of a remedy whose action is exhausted, or the momentary cessation may follow and be due to premature labor or abortion. Then the vomiting returns with increased severity.

The progress of this terrible affection is usually slow, as the patients do not generally succumb until after the second or third month of the disease.

E. *Etiology and Pathological Anatomy.*—We know nothing of the causes of irrepressible vomiting. Some have attributed it to albuminuria, an opinion which nothing goes to confirm, and which would hardly be adopted were it remembered that vomiting is most frequent at the beginning or middle of pregnancy, whilst albuminuria is rarely observed except during the latter months.

Of the silence of pathological anatomy in regard to this disease, I have lately had an additional proof.

A woman with irrepressible vomiting entered my ward, at La Pitié, where I was temporarily on duty. She was delivered spontaneously during the eighth month, but, after a remission, the symptoms reappeared, and she died a few days subsequently. The autopsy, conducted with the greatest care, discovered no lesion in any organ; the genital organs, the abdominal and thoracic viscera, and the encephalon, being perfectly healthy.]

F. *Diagnosis.*—In moderate cases the diagnosis is easy. Here, the absence of acute symptoms, such as redness of the tongue and pain upon pressure on the epigastrium, would settle the question, even were pregnancy doubtful. But if, in the cases just spoken of, the nature of the epigastric pain be misunderstood, the practitioner would be more liable to error; therefore he should be very careful in his proceedings. For example, I have known a case of vomiting, which the autopsy proved to have been dependent upon tubercular peritonitis attributed to a pregnancy which did not exist. In the case of another female, who had actually been pregnant for two months and a half, the examination after death discovered a serious disease of the stomach, amply sufficient to account for the vomiting. In the latter case, it is true that an admixture of blood with the matters vomited had, during life, excited suspicion of organic disease. This very case has, however, been quoted to me by some persons as one of incurable vomiting occasioned by pregnancy. Mistakes of this kind ought not to be made, and the same may be said in regard to epigastric and other hernias.

[G. *Prognosis.*—The prognosis in the grave form of this affection is serious. In 118 cases collected by M. Guéniot there were 72 recoveries and 46 deaths, represented as follows:

Recoveries.

Without abortion in very severe cases and after a very diversified treatment	31
Following spontaneous abortion, also in very severe cases	20
After abortion or induced labor in cases more or less desperate	21

Deaths.

Without abortion	28
After abortion or spontaneous premature labor	7
After procured abortion	11

It is but just to say that in this table of mortality M. Guéniot included all the cases he was able to collect, and that amongst them are some in which death was evidently due to some other disease than the vomiting itself.

Cases of irrepressible vomiting are serious from the outset, inasmuch as, notwithstanding all the modes of treatment employed, abortion included, it is impossible to know whether they will be certainly arrested.

The prognosis becomes still more unfavorable in the second stage of the disorder, for when the patients are much debilitated and the fever constant some will succumb without having either the fetid breath or cerebral disorders. Of such cases two have come under my notice.

In the last stage death is almost inevitable, and we ought not to be deceived by the remission of vomiting which then occurs. It should also be borne in mind that the cerebral symptoms which accompany this phase of the disease are various. In two cases I observed only a little hebetude and slight strabismus without other nervous disturbance: so that, before reaching the correct diagnosis, typhoid fever or a cerebral tumor might be suspected.]

Generally speaking, even when the vomiting is not so great as to compromise the life and health of the mother, it has but an indirect influence upon the life of the child, nor do I know of a single well-attested case of death of the fœtus from inanition through defective nutrition of the mother.

Still, we may understand how the violent efforts of the mother may sometimes communicate such shocks to the uterus as to bring on premature contractions and even abortion. We can also comprehend how the same efforts may produce vascular congestion of the womb, giving rise to rupture of some of the utero-placental vessels and detachment of the placenta; such accidents are, however, rare. In grave cases, results of the kind are rather to be desired than deprecated, for vomiting generally ceases upon the death of the fœtus, and the mother escapes the threatened danger.

3. *Treatment of the Vomiting of Pregnancy.*—There are but few medicines that have not been proposed, at one time or another, for this affection of pregnant women; and at other times recourse has been had to surgical procedures. We will, therefore, examine successively the medical and surgical treatment.

A. *Medical Treatment.*—When the emesis is slight, and only occurring in the morning, we may recommend an aromatic infusion of the lime-tree, orange-flower, common tea, etc., etc. Where it comes on after a meal during the day, it is advisable to change the order of the repasts: for example, if it be generally more distressing after supper, the patient should sup sparingly and eat more breakfast. Cold aliments are sometimes retained when others are rejected. Iced drinks, mineral waters, and swallowing small pieces of ice, have arrested some cases of obstinate vomiting, which set at defiance the whole series of antispasmodics. The subnitrate of bismuth, in doses of from four to eight grains, before each meal, has appeared to me of late to be of some service. I have also directed two or three spoonfuls of kirsch to be taken after meals, and I think with some success. Should it persist, notwithstanding these measures, a resort may be had to a remedy which has often succeeded perfectly in my hands—I allude to the narcotics. About an hour before the meal, let her take one-third or one-half a grain of the aqueous extract of opium made into a pill; but when she is constipated, it will be necessary to administer some mild purgative to counteract any action the opium may have on the large intestine.

Whenever the emesis is attended with pain and stricture at the epigastrium, leeches have been recommended over this part, though I have rarely seen their application followed by any benefit. I should prefer laudanum lotions, or the application of a cataplasm well tinctured with this fluid. Sometimes I have successfully applied a small blister to the epigastrium, and subsequently sprinkled the sixth or the third of a grain of the muriate or acetate of morphia over it.

M. Dezon mentions three cases of obstinate vomiting, which yielded to the continued application to the epigastrium of a towel wet with cold water and renewed every five minutes.

If the vomiting occasions pains in the loins or hypogastrium—in a word, if it threatens an abortion, or if the patient be plethoric, and this condition is manifested by local or general phenomena, venesection in the arm should be resorted to, as this is one of the best measures I am acquainted with, especially during the last half of gestation. Enemata containing laudanum are also very useful for the prevention of abortion, as well as for alleviating the vomiting and calming the irritability of the uterus. General bathing may be added to these measures with advantage.

Dance reports two cases, from which he feels authorized to conclude that these vomitings are often an evidence of a morbid activity in the uterine system, of an inflammation of the membranes; and consequently he advises direct antiphlogistic measures, especially in the neighborhood of the womb; but as his opinion is founded on two cases only, which, after all, are not conclusive, it seems to me that it cannot be admitted as a rule of practice. Still, leeching the neck of the uterus yielded unlooked-for results in cases of Ch. Clay and M. Clertan (of Dijon).

With regard to the regimen, doubtless a mild liquid diet, composed of aliments that are easily digested, seems at first to possess decided advantages over all others; but how many exceptions! how many women reject the mildest articles—even liquids, and yet readily digest less suitable substances! How often, indeed, have I not seen women eat ham, liver, pie, etc., who could not digest a piece of sole, or the white meat of fowl! Of course, we must respect these peculiarities of the stomach.

Among the various measures recommended, but which I have rarely had occasion to resort to, may be mentioned the application of cups to the pit of the stomach (Mauriceau); of a plaster of theriaca (Sydenham); a few spoonfuls of sherry wine, or even some brandy, ether, peppermint-water, the potion of Riviere, and the colombo root.

In those cases in which there was some degree of regularity in the return of the pains, and febrile action, Desormeaux gave two or three grains of the dry extract of cinchona with success. Lastly, Walter and Blundell have highly extolled the use of hydrocyanic acid in the dose of one or two drops, in some mucilaginous drink, several times a day. With the same idea, I have successfully given kirsch after meals, either undiluted or on a lump of sugar. The latter plan has seemed especially useful when the vomiting was preceded by uncomfortable sensations in the stomach or long-continued nausea—a state of things resembling sea-sickness.

To overcome the acidity of the primæ viæ, M. Chomel recommends the use of alkalies, as the water from the springs of Vichy and Bussang; also dilute solutions of potash and soda, magnesia with milk, but never milk alone, and an avoidance of acids.

Alcoholic liquors, given to the extent of intoxication, have met with real success. M. Rayer tells me that he has used them with great advantage, and champagne wine, recommended by M. Moreau in a case so obstinate as to cause great frequency of pulse and delirium, put an end at once to the symptoms. M. Jacquemin, who related the case to me, considered the patient as lost, and had only called the professor in consultation in order to obtain his opinion in regard to the propriety of producing abortion.

M. Bretonneau, being induced to try belladonna, in the idea that possibly the vomiting might be occasioned by rigidity of the uterus, succeeded in quieting it, even in very grave cases, by rubbing the abdomen with a concentrated solution of that medicament.

In one very serious case, in which the vomiting had resisted every effort, even Bretonneau's measure, and in which the poor patient seemed doomed to a speedy death, I conceived the idea of applying the belladonna to the neck of the uterus; this was done by means of the speculum. A brush, laden with the soft extract, was introduced, and the neck, together with the inferior segment of the uterus and the walls of the vagina, were besmeared with it. From this moment, a marked change for the better was manifest, and after the same unctions had been repeated on four successive days, I had the satisfaction of finding my patient cured. It is my duty to add, that in another case the same means failed completely, though I think the failure due to the mode of application. When, as in this case, a brush is used, it is difficult to apply the ointment, and too little of it is sometimes left behind. I have, therefore, for a long time preferred covering a tampon of charpie or cotton with the extract of belladonna, and, after placing it in contact with the cervix by means of a speculum, leaving it there. This may be done morning and evening. The first symptoms of intoxication, such as dilatation of the eyelids, a sense of heat in the throat and slight hallucinations, need occasion no alarm, inasmuch as the effects of the medicament are not felt until then. The patient ought, however, to be watched, and the tampon removed if the symptoms become more serious. This method has been thrice successful in my hands.

M. Stackler overcame the vomiting in two cases by the black oxide of mercury, in the dose of one grain daily. The prolonged use of the remedy was unaccompanied by salivation.

[Iodine in various forms has been recommended. Eulenberg (of Coblenz), following the example of Schmidt, has used the tincture successfully, whilst Ricord and Bacarisse derived equal advantage from iodide of potassium given to the amount of from ten to fifteen grains daily.

"Simpson," says M. Guéniot, "found the salts of cerium very efficacious, especially the oxalate, in 45* grain doses three or four times a day. I would add that the latter salt failed entirely in a case related by M. Danyau, in which it was used by him and M. Dubois, nothing short of a partial detachment of the ovum sufficing to relieve the patient from the danger which menaced her."]

The obstinate constipation which the patients suffer is very remarkable, and has not received the attention it deserves. The bowels sometimes remain unmoved for eight, ten, or even fifteen days. Strongly impressed with this fact, and supposing that the constipation might have some effect upon the continuance of the vomiting, I endeavored to overcome it; but, fearing the effect of emetics or drastic purgatives upon a weakened and pregnant female, my first efforts were too cautious to be successful. Encouraged since then by the experience of other practitioners, especially by M. Forgue, of Etampes, I have had every reason to be satisfied with a bolder course.

The above-named physician addressed to the Academy of Medicine a memoir, in which he lauded the effect of emetics and purgatives, but insisted much upon what he called a *preparatory treatment*, consisting in the administration to the patient for two or three days, a ptisan of barley-water, weakened with honey, to each quart of which he adds a drachm and a half of sulphate of potash; giving also, morning and evening, an enema of a strong decoction of *mercurialis annua*. When some stools have been thus obtained, he orders a bottle of Seidlitz water containing a grain and a half of tartar emetic, after which he continues the purgative for several days longer. M. Forgue claims to have treated five cases successfully by his method.

In endeavoring to try this plan, I have always found it impossible to overcome the dislike of the patient to drinking enough of M. Forgue's ptisan (about two quarts in twenty-four hours). I am, therefore, in the habit of giving the emetic at once, when the

* The translator ventures to suggest that the dose of oxalate of cerium here described ("3 grammes") may be an oversight on the part of the author or printer, it being his impression that it greatly exceeds the dose recommended by Dr. Simpson. It might stand "3 grains."

saburral condition of the tongue seems to indicate it: which is not often the case. Generally, I order at once ten grains of scammony with fifteen grains of jalap. As the first dose is often rejected by vomiting, I order it to be followed immediately by another, and sometimes even by a third, should the vomiting continue.

The second or third dose is generally retained, and the purgative effect followed by a marked relief.

In the case of a patient two months and a half advanced in pregnancy, to whom I was called in consultation by Dr. Briau, Professor Moreau discovered by the touch that the uterus was not only completely retroverted, but wedged, as it were, in the depths of the pelvic cavity. Suspecting that this displacement might have some effect to maintain the vomiting, he corrected it by lifting the uterus above the superior strait and bringing it into correspondence with its axis. Immediate relief followed, and the vomiting, which had proved intractable to a host of remedies, ceased on the same day, nor did it again return.

M. Moreau said that he had seen several similar cases. I had indeed myself, before this, observed the same accident, but not having acted upon the indication, our Honorable master conferred a real service in making known the fortunate result which he had thus obtained.

In future, therefore, the state of the uterus should be ascertained in all cases of incorrigible vomiting. Experience has, however, taught me, that although displacement of the uterus often coincides with gastric disorder, M. Moreau's good fortune is not always to be expected. Three times since M. Briau's case have I observed the coincidence indicated by my colleague. In three patients suffering from obstinate vomiting, I found the uterus not retroverted, as in M. Moreau's case, but so far anteverted that the anterior surface of the womb projected considerably at the upper part of the cavity, its upper border resting against the posterior face of the pubis. The reduction, though easily accomplished, could not be maintained, and the organ very soon resumed its primitive position. Several attempts at reduction were equally unsuccessful.

Why, then, was I less fortunate than M. Moreau? I am inclined to think it was because of the different stages of pregnancy in our patients respectively. That of M. Moreau had reached three months or three months and a half; two of mine were only two months gone. Now, if at three months and a half the size of the uterus is sufficient to keep it above the superior strait after reduction, and that it can only, in some exceptional instances, fall back into the cavity, the case is very different at an earlier period. At two months, in fact, the uterus is so much smaller, and therefore so much more movable, that it yields readily to every cause of displacement brought to bear upon it, and, as though by the force of a bad habit, readily resumes its faulty position when the restoring effort is no longer made.

We ought, therefore, in reference to M. Moreau's plan, to have great regard to the duration of the pregnancy; very efficient after the third month, it will generally be useless at six weeks or two months. Unfortunately it happens that incorrigible vomiting is more apt to occur at the latter period.

All my efforts to remedy the difficulty by means devised for keeping the uterus in situ after reduction have been fruitless. I had made an elongated compress, which, when placed above the pubis, depressed strongly the wall of the hypogastrium, and at first seemed to keep the womb in place. Soon, however, it slipped beneath the pad, fell back into the pelvic cavity, and as the bandage thenceforth did more harm than good, I was obliged to give it up.

It was natural to think of Gariel's pessary, but I dared not keep so large a body in the vagina of a pregnant woman, lest it should have the effect on the uterus of a tampon which so often causes abortion or brings on premature labor.

In short, M. Moreau's success in the case related by M. Briau is an encouragement to make similar attempts, as, after all, they do no harm when prudently conducted; yet, they are not to be relied on when the patient has not advanced beyond the first two months of pregnancy.

I have thus enumerated all these remedies, because they may be successively employed in this affection. In fact, the same medicine may act on one female and have no effect on another. And it must be confessed that sometimes all will fail, and we can scarcely succeed in moderating the patient's sufferings. The change of medicine is, however, useful, either by really calming her distress in a measure, or by sustaining her spirits, not seeming to abandon her, but holding out the idea that each new remedy may effect some amelioration. In this way she gradually approaches towards term, or at least to a period of gestation when the symptoms often disappear of themselves.

[In the treatment of the vomiting of pregnancy it is often the case that the physician relies too much upon medicine, and gives too little attention to the regulation of the diet.

The patient should not rise from her bed in the morning until she has taken her coffee and a roll, or food of some kind, and it is also important that the food taken through the day should be in small quantities and taken often.—G.]

B. *Surgical Treatment.*—But where the vomitings continue, notwithstanding all the rational measures resorted to, the woman absolutely throwing up everything she takes, and the privation from food has reduced her to such a state of emaciation as to endanger life, and the symptoms which we have described as belonging to the second and third stages appear, some accoucheurs have advised (if her term is still remote) the production of premature labor. This operation has already been practised, in similar cases, by several English and German accoucheurs, with full success, both for the mother and child.

It seems to me that it cannot be improper to resort to this measure after the seventh month of gestation, for it then appears to be fully justified both by the dangers to which the mother is exposed, and by the possibility of the child living after its expulsion.

But is the case the same before the sixth month, when the sudden termination of pregnancy must necessarily lead to the death of the fœtus? This is one of the gravest questions which can come up in practice. Although fully disposed to sacrifice the child whenever that sacrifice will *surely* save the life of the mother, as in cases of extreme narrowing of the pelvis, I make no hesitation in declaring myself against the production of abortion under the circumstances in question.

I shall proceed to justify this proscription:—

1. When a woman having a contracted pelvis presents herself to a physician, he knows very well that if the pregnancy be allowed to go on until term, he will have to choose between embryotomy and the Cæsarean operation; also, that in some cases the latter operation will be the only resource. If, after mature consideration of the inevitable consequences of the one and the probable consequences of the other, he decides upon the mutilation of the child, it will doubtless appear to him reasonable not to wait until the increased size of the fœtus at term shall add to the difficulties and dangers of embryotomy; therefore, the production of abortion within the first four months of gestation will seem to be fully justifiable.

But the conditions are different when the life of the mother is compromised by vomiting, however severe it may be.

In the first case, the danger is inevitable; and, unless abortion occurs spontaneously, the Cæsarean operation is the only resource, and we are aware of the usual consequence of the latter. But however intense the vomitings may be, and notwithstanding the state of exhaustion to which they reduce the female, still they are not inevitably fatal. Patients, whose condition justly excited the greatest solicitude, have been known to resist until the latter months and even until the term of their pregnancy, and then give birth to strong and healthy children. Others, whom the vomiting had reduced to a hopeless condition, have been suddenly restored to the most complete health. A case of this kind has fallen under my own notice, and the following was related to me (June, 1849) by M. P. Dubois.

A young German lady, two months and a half pregnant, had

been troubled with the most obstinate vomiting from the first two weeks after conception. For the last six weeks especially she vomited almost without intermission; the smallest spoonful of fluid exciting violent contractions of the stomach. She was extremely emaciated and feeble, and her breath was disgustingly fetid; in short, her symptoms were so serious that M. Dubois, who was called in consultation, requested the additional advice of M. Chomel. Both these gentlemen came to a most unfavorable prognosis, and left the patient, under the impression that she had but a few days to live. Some cold applications were the only remedies advised; but the attending physician, being alarmed at her extreme weakness, limited them to slight aspersions. On the second day after the consultation the patient was attacked with violent purging, and from that time the vomiting ceased and never returned. The poor sufferer was at once able to take and retain some nourishment, which, being gradually increased in amount, soon restored her strength. Now, this woman, who had been so greatly reduced that two eminent men regarded her fate as sealed, is in the enjoyment of perfect health, and has almost reached the middle of her pregnancy with every prospect of a happy termination.

In two other cases, which the professor related with commendable frankness, he had deemed it his duty to propose the induction of premature labor. The women declined submitting to the operation, and reached the end of their pregnancies in good health.

2. When abortion is produced in cases of extreme contraction of the pelvis, there is a certainty that, when once accomplished, all the dangers which threatened the termination of the pregnancy are at an end, and that only the usual consequences of miscarriages can follow from the operation. Even supposing that the artificial means should add to the ordinary risks of spontaneous abortions, the object is nevertheless certainly attained in terminating a pregnancy whose progress so greatly endangered the mother's life.

The conditions are very different in cases of spontaneous vomiting, for if all the instances on record be referred to, it will be found that the operation is far from removing the danger. I am well aware that four or five fortunate cases have been cited from the practice of English accoucheurs, but we are not told how often it has been followed by death.

Are the circumstances the same in cases of obstinate vomiting? If unsuccessful, the operation was performed too late, say they, when the prolonged defective nutrition of the mother had exhausted the vital powers; and had the uterus been emptied sooner, the chances of success had certainly been greater.

I believe this fully; but here it is that the most difficult question arises. When is the operation proper? If you act too soon, may it not be said, whilst instancing the cases of spontaneous cessation of the vomiting, as in those which have been quoted, that you have destroyed the fœtus without advantage? If you act too late, may you not be equally reproached, in view of the failure of all known operations, with an attempt which may have hastened the fatal termination?

Where will the prudent practitioner place the limit of expectancy? If it be remembered that the ancient accoucheurs declared, as do Mauriceau and Delamotte, that the vomitings may possibly produce abortion, yet are not dangerous for the mother; also that many moderns assert, with Burns and Desormeaux, that they have never known them to terminate fatally, there would certainly be small temptation to operate before all hope has been dissipated by the gravity of the symptoms. Our hopes, indeed! But does not nature sometimes mock at our expectations? Did not the patient of MM. Dubois and Chomel seem doomed to certain death?

I know it may be answered that it must be left to the tact and skill of the practitioner to think deeply, and choose conscientiously between the dangers of expectation and the chances of an operation; that the difficulties which I raise present in a host of surgical cases; that there is barely an amputation which may not be authorized by affirming, *dogmatically*, that a spontaneous cure is impossible; that the exceptional preservation of a limb proves nothing against the propriety of amputation in a majority of similar cases.

All this is doubtless true; but let us not decide too quickly, for the comparison is far from being strictly just.

When the surgeon has to deal with a serious traumatic lesion, he regards nothing but the interest of his patient; and after explaining to him the grounds of his conclusion, may, in cases of difficulty, consult his wishes, and then leave his life at his own disposal. The accoucheur has the serious interest of two beings to care for; and though the instinct of self-preservation may silence in the female the voice of maternal feeling, it is nevertheless his duty to protect the fœtus, with whose welfare he is equally intrusted.

In a given traumatic lesion, all experience shows that spontaneous recovery is a rare exception. On the other hand, the experience of all accoucheurs goes to prove that the spontaneous cessation of vomiting is of almost universal occurrence.

We thus see that the surgeon and the accoucheur stand on a different footing, and that the difficulty which I have suggested is not removed by the comparison which has been made between them with that object.

[We shall proceed no further with this discussion, but first of all examine the facts. Experience having shown that abortion and spontaneous labor were, in cases of obstinate vomiting, often followed by recovery, it was naturally asked by physicians whether the process adopted by nature might not properly be effected by art. Some trials having been made here and there, M. Dénieux succeeded in collecting 32 of them, which he quotes in his thesis, giving as a result 21 recoveries and 11 deaths. Of the 21 successful cases, 15 were abortions, and 6 premature labors. To these we would add a case of our own, in which the vomiting being severe, and death imminent, it was decided, in consultation with Drs. Millard and Charrier, that abortion should be produced. The operation was successful. It was a twin pregnancy of two months duration.

Our conclusion is, that procured abortion, as well as premature delivery, is a valuable resource in intractable vomiting. It is nevertheless true that it has the great disadvantage of certainly sacrificing the life of the child; therefore, before undertaking the operation, the conviction derived from mature consideration that no other course remains by which the mother's life can be saved, should be sustained by the concurrence of several medical friends in consultation.

It is, in fact, more difficult under these circumstances than in a case of extreme contraction of the pelvis to determine the propriety of producing abortion, and that, too, without having the same certainty of saving the patient. We shall not revert to the comparison of such cases, already made on page 66.

Another difficult question remains to be settled: At what time ought abortion to be effected? In reply, we can do no better than quote the opinion of P. Dubois. "The production of abortion in the third stage of the disease is liable to the grave objection of not saving the patients, but of hastening their end and compromising our art. If done in the first stage, there would be the not less serious error of sacrificing a pregnancy which might, perhaps, have progressed happily to its term. Therefore, we conclude that the operation is applicable to the period intermediate to those mentioned." We would here call to mind that this second period is characterized: 1, by almost incessant vomiting, produced by all kinds of food, and sometimes, also, by the least quantity of pure water; 2, by debility so great as to keep the patient at rest, and occasionally by syncope; 3, continued fever; 4, in certain cases by a fetid and even putrid breath. When to these symptoms is added the failure of all the medication which has been tried, it is right to advise abortion, leaving with the family the responsibility of deciding upon it as a last resort.

Different operative procedures may be employed, the comparative value of which will come under discussion hereafter. (See *Operations.*)]

§ 4. Constipation. Diarrhœa.

Constipation is a very common affection in pregnant women, and it is usually attributed to the pressure of the developed uterus on the upper part of the rectum, by which not only the calibre is diminished, but its action is also paralyzed. Would it not be more reasonable to attribute it in many cases to a commencing chlorosis? We know, indeed, that constipation is so common in the latter disease that Hamilton regarded it as one of its causes. Some authors attribute it to diminished secretion of bile. When carried too far it often produces anorexia, and disordered digestion, and becomes a cause of agitation and loss of sleep. Whatever be its cause, the strainings necessary to expel the hardened fæces that have accumulated in the intestine, may give rise to hemorrhage and abortion.

The best measures for preventing and remedying this state are nearly identical with those used at other periods of life.

The same remarks apply to the diarrhœa with which women are often tormented.

[Constipation, as just said, is very common during pregnancy. Diarrhœa sometimes occurs, and that more frequently than seems to be generally suspected.

The diarrhœa of pregnancy varies in character, and is due to different causes. Sometimes it alternates with the constipation which gives rise to it, and which is relieved thereby. At other times it coincides so nearly with conception as to be its first symptom; again, it may appear only during the last days of gestation, and indicate the imminence of labor. In none of these forms does it present any gravity, and is amenable to the treatment usually employed in such cases.

Exceptionally, however, severe diarrhœa may supervene during pregnancy, without any assignable cause. The passages are profuse and frequent, and accompanied with tenesmus; emaciation takes place with exhaustion of strength, the mouth becomes dry, and fever sets in.

Some of these cases resist all kinds of treatment, and may lead to abortion or premature labor. This form, to which the term intractable might well be applied, may prove fatal to the mother either before or after delivery. One case of the kind has come under our own observation.]

ARTICLE II.

LESIONS OF RESPIRATION.

Cough and dyspnœa are about the only affections claiming our examination under this title.

The dyspnœa that supervenes towards the end of pregnancy is evidently produced by the crowding of the lungs from the excessive uterine development, and the delivery alone can cure it; but sometimes it is sooner manifested in consequence of a pulmonary congestion, which must be remedied by general blood-letting, a light regimen, repose in a suitable position, and loose clothing.

The same may be said of such palpitations as are not due to organic disease which existed before the pregnancy; but it must not be forgotten that, though bleeding is useful when the dyspnœa or palpitations are very severe, by diminishing the local congestion for the time, the latter is much more frequently due to hydræmia than to a true plethora, and that the best means for preventing its return is to follow the bleeding by tonic remedies. (See the following article.)

As to the cough, it is only dangerous as regards the pregnancy, by the violent jars sometimes given, which may produce an abortion. Indeed, all observers who have written on influenza have carefully noted the frequency of this accident in women who were affected with it.

When the cough is the effect of pregnancy, it may sometimes be attributed to local plethora, and then we should bleed. But at other times it has a spasmodic character resembling whooping-cough, with the exception of the alteration of the voice. In such cases, I have derived much advantage from baths, repeated for several days in succession.

When it is the symptom of a chronic malady, existing prior to gestation, the treatment will vary with the disease that produced the cough. Whatever may be its origin, the accoucheur should always resort to such demulcents and pectorals as are calculated to diminish its intensity.

ARTICLE III.

LESIONS OF THE CIRCULATION.

§ 1. Alterations of the Blood. Plethora and Hydræmia.

The general circulation is more active in pregnant women than in others, and this increased activity manifests itself by a greater frequency of pulse, which is often harder and fuller than in the non-gravid state. Though all this may be regarded as normal, it sometimes becomes exaggerated and gives rise to a slightly morbid condition. Thus, some women experience, at the same time, vertigo, dimness of vision, ringing of the ears, sudden flushings of the face, spontaneous heats over the body, but more especially of the head. If bleeding be practised under these circumstances, the blood will sometimes afford a large and consistent clot with but little serum; though much more frequently there is much serum, and a small clot, covered with a distinct whitish coat, resembling that observed in inflammatory diseases.

The differences in the appearance of the blood drawn by venesection ought to have excited the suspicion that, notwithstanding their identity, these functional disturbances might be produced by different causes; and although some scattering therapeutic measures induce the supposition that the idea had suggested itself to some good minds, it is also evident that it was almost immediately stifled; for the majority of authors, even the most recent, do not hesitate to refer them to plethora, and making the treatment correspond with the etiology, recommend blood-letting as the best means of overcoming it.

The little advantage which I had derived from this practice had for several years excited doubts in my mind as to the value of the theory; which doubts were especially increased by reading the admirable investigations by M. Andral on the blood. Therefore, in treating, in 1844, in the second edition of this work, of the plethora of pregnant females, I wrote as follows: "After having read the curious statements just given (*analysis of the blood by M. Andral*), the reader will perhaps find them to disagree with the title of this paragraph, and possibly also with the therapeutic measures hereafter recommended; for how, indeed, can we reconcile this denomination of plethora, applied to the totality of the phenomena observed in most gravid females, with the evidences of anæmia furnished by the analysis of the blood? *Is it not probable that the profession has heretofore been in error,* in attributing to this cause what in fact is only due to an impoverishment of the blood? Because, if to these results we add the beating of the carotids, the caprices of the stomach, the digestive disorders, and the varied nervous phenomena that occur during pregnancy, and which closely resemble those so often observed in chlorotic patients, are we not *irresistibly* brought to the conclusion, that the chlorosis which produces them in the one case also does in the other? and, consequently, that the bleeding generally recommended is more likely to augment than to diminish such disorders? A sufficient number of facts are still wanting to decide the question satisfactorily; but, while presenting in this work the views most generally received, we cannot conceal the effects produced on our mind by the experiments of Andral and Gavarret."

From that time we have endeavored to test by facts the inferences which we had drawn from the documents furnished by the experiments of these two learned professors; and we have to say, that the theory is confirmed by practice. Therefore we now assert boldly, what we before expressed timidly in a simple note: *That hydræmia is the most frequent cause of those functional disorders of pregnant women which have hitherto been attributed to plethora.*

However strange this proposition may at first appear, it seems to us to be proved by the results of the chemical analysis of the

blood, by the symptoms presented by the patients, and by the happy effects of a tonic treatment.

It is now well proved that the essential character of plethora is based upon a great increase in the proportion of the blood corpuscles, as their diminution is the distinctive fact in anæmia. And it is well known that diminution of the corpuscles and increased proportion of water are the essential characteristics of anæmia and chlorosis. Now we have shown, whilst describing the changes in the blood during pregnancy, that the amount of corpuscles diminishes, whilst that of water increases. In this respect, therefore, pregnant women may be strictly compared with those affected with chlorosis. The increase of fibrin and diminution of albumen also observed during gestation are of more difficult explanation.

The deficient nutrition of the mother, who is obliged, whatever may happen, to supply the fœtus with the food required for its development, may also explain the excess of fibrin, and, in addition, the decrease of the corpuscles; for the experiments of M. Andral have shown that the blood of dogs, subjected to certain degrees of abstinence, presented the characters of chloro-anæmia, and coincided with a marked increase of the fibrin. Again, if we admit, with some modern chemists, that the fibrin is formed at the expense of the albumen of the blood, may we not find in the considerable diminution of the latter the cause of the increase of the former?

Finally, we would add that MM. Becquerel and Rodier, the only observers whose analyses give the proportion of iron in the blood of pregnant women, have shown that it is below the physiological average. Thus, in 1,000 grammes of the calcined blood of a healthy and non-pregnant woman, the average proportion of iron is 0·541; in that of the pregnant female it is 0·449; and in well-marked chlorosis it is 0·366. The proportion of iron follows, therefore, that of the corpuscles, and the expression of its amount during pregnancy will serve to indicate the transition from the healthy condition to confirmed chlorosis.

From all that has been said, we think it may be concluded that the principal elements of the blood undergo alterations during pregnancy analogous to those of chlorosis. These changes are doubtless in many cases purely physiological, as we have already stated, but may so increase as to become pathological by the establishment of hydræmia and chloro-anæmia.

The view which we take will become still clearer when we shall have proved the following proposition:

The Functional Disorders of Pregnancy hitherto attributed to Plethora are those of Chlorosis. Most of the authors who have written upon the functional disorders of pregnancy have attributed them to plethora, on account of the peculiar physiognomy which they present. Thus, because in many pregnant females they observed fulness and hardness of the pulse, a feeling of heaviness in the head with somnolence, vertigo, ringing in the ears, flashes of heat, sudden flushings of the face, etc., they regarded them unhesitatingly as the expression of encephalic congestions, themselves the consequence of general plethora.

Now it is really only necessary to read the list of symptoms belonging to chlorosis in order to be convinced that they are identical for the two affections.

This is easily explained, says M. Andral, by observing that if the mere passage of too great an amount of corpuscles through the vessels of the brain appears to account sufficiently for the cerebral disorders witnessed in plethora, it follows that too small an amount of corpuscles traversing the same vessels will produce similar disorders; so that too great or too small an amount of corpuscles deranges certain actions of the brain in the same manner. Therefore, the true cause of the symptoms is not to be judged of by their external characters, but only by the changes in the blood. Now, the analysis of the blood of a large number of females, who complained of these supposed plethoric phenomena, has shown a marked diminution of corpuscles and an increase of serum.

Besides, if we remember what has already been said concerning the pathology of pregnancy, it will be found that there is hardly one of the functional disorders yet studied which is not also observed in chlorotic women. What is more common than to find in chloro-anæmic patients the want of appetite, disgust for food, whimsical and depraved tastes, cramps and pains in the stomach, nausea and vomiting,—in short, all those symptoms of gastralgia which render many pregnancies so suffering? Are not also the headaches, toothaches, faintings, and the facial, frontal, orbital, or temporal neuralgias, common, so to speak, to the two conditions? As regards the circulation, do we not observe the same modifications in the strength of the impulse, the rhythm, and the clearness of the pulsations of the heart, and is not a bellows murmur also heard in the principal vascular trunks?

Some of these various disorders, such as the nervous phenomena, are more particularly observed in the first half of pregnancy; others, such as the pretended symptoms of plethora, trouble more especially those females who have reached a more advanced period. It must, however, be confessed, that sometimes all of them appear at the beginning, and sometimes at the end of gestation, which fact some persons have thought to militate against my theory. Why, said M. Jacquemier, should the same symptoms, which are regarded as disorders due to sympathy with the uterus, if they appear during the first half of pregnancy, be considered as caused by chlorosis, if they appear during the second half? Is there not something arbitrary and artificial in this,—something which seems to have been devised expressly for the support of a theory?

In the first place, I would observe that I have only spoken of the uncomfortable sensations which women experience in the latter months; but in supposing the similarity of the symptoms, there is nothing irrational in attributing to them a different origin. I may be allowed to recall what takes place in the case of a young girl becoming chlorotic: it will be seen that the succession of phenomena is absolutely the same as what I have supposed for the chlorosis of pregnant women. A healthy young girl reaches the age of puberty, when, under the influence of causes which we often cannot appreciate, the menstruation fails to become established, or takes place only in an imperfect or irregular manner. The uterus, being disturbed in the exercise of its monthly functions, soon reacts upon all the other organs. The appetite diminishes, the stomach becomes capricious, the tastes whimsical, the digestion painful; and from the persistence of this difficult digestion results incomplete assimilation, and soon deficient nutrition. After the lapse of a few weeks or months, the defective nutrition produces an alteration in the composition of the blood, which, when carried to a certain degree, produces all the symptoms of chlorosis,—symptoms bearing a strong resemblance to those which preceded and caused the general disease of which they are the expression.

No one, certainly, will deny the truth of the picture just drawn. Now, is not the same succession of phenomena witnessed in pregnancy? In both cases, is it not the irritation of the uterus, produced by the new functions, which first reacts upon the other functions of the economy, disturbing their regular fulfilment, which afterward interferes with the assimilation of nutritive matters, and which finally produces chlorosis? Is not the latter condition indicated in the pregnant woman, as in the young girl, by the same symptoms? Where then is the difference? And if it be allowed that the primary functional disorders of the young girl are purely sympathetic, whilst those which occur later are attributable to chlorosis, why should we refuse to acknowledge the same as occurring during pregnancy?

After thus recalling the fact, that all the functional disorders of chlorosis are sometimes observed during pregnancy, it truly becomes a matter of astonishment that the resemblance between the two should not have been noted earlier, and that it should have been left for recent analyses to excite the suspicion that the same symptoms might be due to the same cause.

The pathological anatomy and symptomatology being then in accordance with each other, it remains to be seen whether the treatment will afford another evidence of the nature of the disorder.

Plethora was formerly considered so common, and so exclusively the cause of the diseases of pregnancy, that blood-letting had become a general practice. So strongly impressed were many women with the idea of the necessity of bleeding, that they thought themselves under an obligation to have recourse to it by the time they had reached the fifth month of gestation, and even demanded it before consulting their physician. Most practitioners declined performing these so-called preventive bleedings, though all regarded venesection as the best means of overcoming *plethora*, that is to say, the assemblage of phenomena attributed thereto. If the latter proposition were true, it would constitute an unanswerable objection to the theory we are endeavoring to establish. Fortunately, however, such is not the case.

I certainly do not wish to deny the amelioration produced by bleeding in certain cases; but it proves nothing against the poverty of the blood, and the chloro-anæmia. The lessened proportion of the corpuscles does not necessarily involve a diminution of the entire mass of the blood, as the word *anæmia* applied to this alteration would seem to indicate. Generally, on the contrary, the amount of this fluid remains the same, and sometimes even is considerably increased; thus corresponding with what M. Beau states to be habitually the case in chlorosis. A true plethora, which might be styled *serous*, then exists, in which case, especially to the usual signs of anæmia, are superadded headache, vertigo, ringing in the ears, etc.; and under these circumstances, bleeding may afford relief by diminishing the amount of blood. The same result is obtained in ordinary chlorosis, when bleeding is practised for the removal of local congestions. But, in pregnancy as in chlorosis, this alleviation is but temporary, and if the proportion of corpuscles be not brought up to the healthy standard by proper hygienic and therapeutic measures, the same symptoms will soon reappear, and with greater intensity. The abstraction of blood is, therefore, in any case, but a palliatory measure, only to be employed in extreme cases, when the general symptoms are very severe, but which might have been avoided by administering tonics and ferruginous preparations at an earlier period.

An animal diet, and preparations of iron, have, for six years back, always appeared to me to be quite as useful against the functional disorders of pregnancy as against those of chlorosis. Unless they be very serious, I no longer bleed for palpitations, pains in the head, or suffocations, nor have I known them, in a single instance, to resist the use of the preparations of iron longer than a couple of weeks. Even when the gravity of the accidents has obliged me to bleed to the extent of six or eight ounces at the utmost, I begin immediately with the use of iron, and it is very rarely that I am obliged as formerly to recur to venesection. Hemorrhage from the bowels might, in some cases, remove the necessity for phlebotomy, and M. Blot was certainly right in advising gentle purgatives under these circumstances.

There is still another condition, in which I have associated iron and bleeding with advantage; with what propriety we shall next see.

The excess of impoverished blood in pregnancy may, as in chlorosis, give rise to local congestion, which congestion, when carried beyond certain limits, explains the occurrence of epistaxis, and the less frequent hæmoptysis and hæmatemesis, all which seem to be the result of an effort on the part of nature to diminish the vascular fulness. These accidents are unusual during pregnancy, or, at least, rarely occur to an alarming extent. The reason seems to be, that from the moment of conception until delivery, all the vital powers appear to be concentrated upon a single organ, which forms a centre of fluxion, towards which all the troubles of the organism converge; this organ is the uterus. The congestion, which in the chlorotic patient occurs in the head or the chest, here takes place in the womb; and the extraordinary development of the vessels of the uterus, and their more or less intimate connection with those of the fœtus, sufficiently explain the danger of an overdetermination of fluid. At a very early period, the congestion may occasion the rupture of one of the numerous capillary vessels distributed upon the internal surface of the mucous membrane (parietal or epichorial decidua); rather later, the congestion may be great enough to rupture one of the utero-placental vessels, and in both cases give rise to an effusion, which, by destroying wholly or in part the utero-placental relations, proves fatal to the child.

These uterine congestions, which are properly considered, in some cases, as the consequence of *general plethora*, I have witnessed much oftener in feeble and anæmic women. They almost always appear at the menstrual periods, as though the monthly periodicity excited at those times a more active vitality in the uterus. The woman complains of tension, of swelling of the abdomen, of a feeling of weight in the pelvis, the groins, and upper part of the thighs; she also soon suffers pain in the region of the kidneys and in the loins. If the proper measures are not employed, the vascular congestion, and the pressure upon the uterine walls resulting from it, irritate the organ; slight contractions occur, sometimes even a little blood flows from the vulva, and announces a threatened abortion. These symptoms are almost always accompanied with marked vesical tenesmus. Can the latter be due to pressure on the neck of the bladder, produced by an increase in the size and weight of the uterus caused by the congestion?

It is evident that when these symptoms of uterine congestion appear, prudence dictates a recourse to all the means likely to effect a revulsion. Thus, sinapisms to the upper and posterior part of the back, seven or eight dry cups to the upper part of the chest, and finally, if these measures are insufficient, bleeding, to the extent of six or eight ounces, as a powerful revulsive, is very useful. But, even here, the bleeding may have only a momentary effect by destroying the local plethora, and by no means enables us to dispense with medicines capable of modifying the state of the blood. We shall return to this subject under the head of *Preventive Treatment of Abortion*. It is proper, however, that I should say in this place, that many of my patients who had suffered frequent miscarriages, have been enabled to attain their full period by the use of iron administered from the beginning of pregnancy.

We see, therefore, and I call the attention of practitioners to this point, that if the medicament which cures a disease sometimes also proves its nature, then the disorders which we have described are oftenest due to chloro-anæmia, and not to plethora. The latter proposition, confirmed as it is by pathological anatomy and symptomatology, I hold to be incontestable.

I say oftenest, for I would not have my assertion regarded as absolute. Though true plethora, that which is distinguished from serous plethora by an increase in the amount of the corpuscles, be rare, it nevertheless is sometimes met with, especially at a very early stage of gestation. Females of a really plethoric constitution, whose menstrual discharge is habitually abundant and high-colored, may retain this constitutional peculiarity during pregnancy, and sometimes even have it increased. The sixty odd analyses which we have quoted, show that, in several instances, the proportion of corpuscles underwent no diminution in the earlier months, and that in the case of one woman who had reached the end of the second month, M. Andral found them increased to one hundred and forty-five. It is even probable that, when analyses shall be more numerous, the same peculiarity will be remarked in some cases of advanced pregnancy. For my own part, I have certainly met with females whose antecedents, symptomatic expression, and the physical properties of whose blood afforded every indication of plethora.

The fact of our having observed but few instances of the latter class is explained by our practising in the metropolis, where all debilitating influences are collected. The hygienic conditions in which women live in the country dispose them less to chlorosis, and it is exceedingly probable that their blood is not so much altered during pregnancy as in the cases we have noticed. To this, I think, is certainly due their exemption from the functional disorders, nervous or otherwise, which so commonly affect the females of large cities. This is an additional argument in favor of my theory.

Though such women are exposed to the general consequences of

plethora, they present more frequently the signs of local or uterine plethora, especially during the first half of pregnancy, at the periodic returns of the menstrual periods. The local phenomena, as tension, swelling of the abdomen, feeling of weight in the pelvis, are very strongly marked in their cases. The circulation of the fœtus also, sometimes, appears to share in the troubles of the maternal circulation, for these signs of congestion are frequently observed to be followed by the weakening, diminished frequency, and even complete cessation of its active motions; and if the motions have not yet been perceived, the plethoric condition may greatly retard their appearance. However difficult the explanation of these peculiarities may appear, they are too common to be doubted. The best proof that can be given of the effect of this local congestion upon the motions of the child, is their prompt reappearance after a venesection made at the proper time; and it very frequently happens that a woman who is five months, or five months and a half, gone, without having felt them, perceives them suddenly after bleeding.

It is unnecessary to state that here blood-letting constitutes the proper treatment, and that the quantity abstracted may be regulated by the circumstances of the individual cases. It is, however, better to practise several small bleedings at short intervals, than to depend upon a single copious one. The production of syncope should be studiously avoided.

We shall have occasion, when treating of abortion, to finish the study of the therapeutical indications.

To recapitulate, the functional disorders of pregnancy, as cephalalgia, giddiness, vertigo, ringing in the ears, dyspnœa, palpitations, etc., are rarely due to true plethora, but most generally to chloro-anæmia. We might indeed distinguish for pregnant women a very rare *sanguineous plethora*, and a very common serous plethora.

Independently of this marked diminution of globules and albumen, the blood is sometimes considerably altered by admixture with the elements of the urine. This alteration, which has been described of late by the Germans under the title of *uræmia*, and of which we shall soon have occasion to speak, is a capital fact in the etiology of several diseases which are liable to appear in the puerperal condition. We merely state the fact for the present, leaving further notice of it until we come to treat of the lesions of the urinary secretion.

§ 2. Hemorrhage.

[Hemorrhage from the genital organs is, unfortunately, but too common during pregnancy, and is an accident much to be apprehended. The hemorrhage may assume very different features according to the cause which produces it and the time of its appearance. On this account it would be so difficult to treat of it in a single chapter, that its history must necessarily be divided into several articles, which we think it best thus to indicate at the outset. Sometimes the effusion of blood is confined to the placenta, and has already been described as placental apoplexy with the other diseases of the placenta. Uterine hemorrhage occurring during the first six months of gestation should, if it be somewhat profuse, excite fears of abortion, which it often gives rise to or accompanies. Under these circumstances it is impossible to separate the study of the hemorrhage from that of the abortion.

Hemorrhage occurring during the last three months of gestation presents, on the other hand, the same symptoms, and requires the same treatment as though it occurred during labor. One description, therefore, suffices for both, and will be given in connection with the history of other accidents which are liable to occur during labor.

Again, rupture of varicose veins of the vulva and vagina gives rise to effusion of blood in these organs. Such an effusion is known as a *thrombus*. As it rarely occurs except during labor, we refer the account of it also to the article on *Dystocia*.

We shall merely refer in this place to a rather rare and curious form of uterine hemorrhage. Some women have a discharge of blood from the vulva a few days after conception. It is small in amount and is sometimes intermittent and sometimes continuous; it is rarely attended with clots, but resembles a moderate menstrual flow. It sometimes lasts for three or four months without interruption, yet neither gives rise to serious symptoms nor interferes with the course of gestation; finally it ceases without assignable cause. In our opinion, the discharge has its source in the neck of the uterus, which, in these cases, has appeared to us both large and softened. The explanation would at least seem probable, when we remember how readily blood exudes from the os tincæ when a pregnant woman is examined by means of a speculum. An ulceration of the cervix would facilitate the discharge of blood. It requires no treatment, the greatest danger being that it might lead to the belief of the non-existence of pregnancy.]

§ 3. Varices. Hemorrhoids.

A varicose condition of the veins in the lower extremities, the vagina, and inferior parts of the rectum, is quite a common occurrence towards the latter part of gestation, though, as regards treatment, the varicose veins in the limbs only require the usual precautions to prevent their rupture. For this, methodical compression is the best remedy, and every attempt at a radical cure should be discountenanced.

[Varicose veins of the limbs sometimes burst during pregnancy, and the resulting hemorrhage is almost always serious in consequence of the pressure of the uterus on the iliac veins. Though some cases are said to have proved fatal, any hemorrhage of this kind is generally easily arrested by well-regulated pressure applied to the seat of the injury.

The veins of the vulva, always dilated during pregnancy, sometimes become varicose, giving the sensation of well-defined cords. No annoyance usually results, though some women complain of a very uncomfortable feeling of weight whilst standing. Moderate pressure by means of a T bandage almost always affords relief.

Rupture of one of these varicose veins may give rise to severe hemorrhage or even death, as in the following case which came under our notice at the hospital of the Clinique. A pregnant woman, in other respects in good health, was affected with varicose veins of the vulva. One evening, whilst about retiring, she attempted, whilst sporting with some of the other women in the dormitory, to leap from her bed. Falling backward, she found herself seated upon a chair, the edge of which had struck against the vulva. A hemorrhage so severe as to prove fatal in a short time was the immediate result. At the autopsy, the only lesion that I could discover was a contused wound about half an inch in length upon the external surface of the left internal labium. Water injected into the primitive iliac vein escaped rapidly from the little wound just mentioned. Had the cause of the hemorrhage been discovered as soon as the accident occurred, the effusion could have been certainly stopped by pressure directly applied.

As the rupture of the veins of the vagina and vulva occurs most frequently during labor, we refer for further particulars to the subject of *Thrombus*.

Hemorrhoids, like varices, are an ordinary consequence of the uterine pressure on the hypogastric vessels; but they may likewise be frequently produced by constipation, and the attendant accumulation of hard matters in the rectum. The bleeding piles are generally less disastrous; but the others are more grave and very painful. In fact, it often happens that women affected with them can neither stand nor walk, and they are even troubled when seated.

The first indication is to combat the costiveness, and then to assuage the pain by tepid bathing, cataplasms, and emollient and narcotic lotions, or the poplar ointment may be applied to the tumors; and where they are internal, a suppository of cocoa-butter might be introduced into the rectum. Liniments containing opium and belladonna will frequently relieve the patients; but this is all that we could prudently do under the circumstances.

When the inflammation and turgescence are very great, bleeding

in the arm is advisable, as this is much preferable to the application of leeches in the immediate neighborhood of the tumor; true, the latter calms the pains temporarily, but then, in certain females, they might bring on an abortion. I have never known, says Desormeaux, the application of leeches on the tumors, or the incision of the latter, to procure any durable relief.

Where the irritation from the piles seems to react on the womb, and threatens a uterine hemorrhage, M. Gendrin has derived signal advantage from cold applications around the pelvis. In those cases, says he, if the hemorrhage is imminent, we augment the activity of the topical remedies placed directly over the parts affected, by using cold baths to the breech at the same time, the temperature of the water never having been lower than 12° or 15° (Centigrade, equivalent to 54° or 59° Fahr.). I have several times employed cold injections successfully. The plan is to take every evening a large cold enema, which after being discharged is followed by a small one, which ought to be retained.

ARTICLE IV.

LESIONS OF THE SECRETIONS AND EXCRETIONS.

§ 1. Ptyalism.

Ptyalism, or a hypersecretion of saliva, sometimes occurs during pregnancy. It generally lasts but a short time, rarely more than two months. One case, however, is mentioned by M. Brachet, in which the salivation commenced in the second month, and lasted for a month after delivery; and I have quite recently observed a similar instance in the case of the wife of one of my professional brethren. It frequently returns in several successive pregnancies. I have seen it continue between six and seven weeks in the first two pregnancies of a lady who has since had another child without a recurrence of the affection; and M. Danyau, Jr., mentions a patient who was profusely salivated for five months in her first pregnancy, and still longer and more profusely in two succeeding gestations.

However considerable the salivation may be, it is rather a disagreeable inconvenience than a serious complication. Though it has in no case materially affected the health, some women have been so annoyed with the continual spitting, and the flow of saliva which sometimes deluges the pillow at night, as to insist upon being relieved of it. Happily, in a large proportion of cases, the ptyalism ceases spontaneously, for no great confidence can be reposed in the measures generally resorted to for its removal. Some advantage, however, may be derived from the use of aromatic infusions and slightly astringent gargles. Like Desormeaux, I have found it useful to recommend the patients constantly to keep a little piece of sugar-candy in the mouth. Others, again, advise lumps of gum arabic, and pieces of ice. It is useful to be acquainted with these various measures, if only to keep up the patience of the sufferer, by varying them from time to time until the disorder ceases of its own accord.

Some authors seem to have dreaded the effect of the sudden suppression of a profuse salivation. Two cases are mentioned, in one of which apoplexy, and in the other symptoms of suffocation, appeared to result from it. I do not think that the relation of cause and effect has been satisfactorily shown in these cases, and am tempted to believe that here, as in many other instances, it has been erroneously concluded, *post hoc, ergo propter hoc.*

§ 2. Excretion of the Urine.

The renal secretion is rarely increased during pregnancy; those writers who have stated the contrary having been deceived by the frequent inclinations to urinate which females experience at certain periods of pregnancy. These repeated desires are due to a true vesicle tenesmus, produced by the compression exerted upon the body and neck of the bladder by the uterine tumor. They occur every hour, sometimes oftener, and are relieved by the discharge of a few drops of urine.

The pressure of the uterus upon the neck of the bladder is sometimes so great as to obstruct the emission of urine, and render it painful or even impossible. This difficulty in urinating may occur in the commencement of pregnancy, either when the pelvis is too large, and permits the uterus to remain a long time in the excavation, or on the occurrence of a prolapsus uteri, or those other displacements of this organ known as anteversion and retroversion.

Most frequently, however, it appears towards the end of gestation, either because the uterus, from being pushed down by the presenting part of the fœtal head, early engages in the excavation, or because the womb is forcibly carried forwards; in the latter case the body of the bladder is pressed upwards and in front by the uterus, and its neck forced against the superior margin of the symphysis pubis.

When the anteversion is well marked, the body of the bladder forms an angle of the neck; in some cases it is even lower, whence the introduction of a catheter is then exceedingly troublesome. After all, the difficulty of urinating still persists until term, whatever we may do; for we can only alleviate it by tepid bathing, the horizontal position, and more particularly by the use of a bandage to sustain the abdomen.

Where the retention is complete, the bladder, by becoming distended, may increase so much in size as to reach the umbilicus, and its excessive distension might produce an inflammation or even a rupture, especially during the throes of labor; but where the neck is not altogether obliterated by the pressure, an incontinence of urine may ensue, the fluid dribbling away drop by drop; though, unfortunately, that is not always the case, and the catheter must then be resorted to.

I have already said this operation is attended by difficulties under such circumstances, and when it is quite impossible to perform it, the distress may be relieved, in a measure, by pressing back the uterus from the symphysis pubis with the two fingers introduced into the vagina, and the woman should be taught to aid herself in this way.

In some instances, the female suffers at the latter stages a considerable smarting or pain in urinating, as sharp as if there was a stone in the bladder; these symptoms arise from a true catarrh of the body, or at least of the neck of this organ; the urine, in fact, often contains whitish flakes of purulent matter. Such symptoms require the general antiphlogistic treatment, local bathing, emollients, and mucilaginous drinks. As a general rule, women only suffer from an incontinence of urine during the last three months, and then the delivery is the only remedy; however, it shows itself in the early stages of gestation in certain females, being evidently produced by the pressure which the uterus, that is still within the pelvis, makes on the neck of the bladder, and it lasts until the womb rises above the superior strait. If the incontinence remains after the fifth month, the symptoms may be relieved by injections of warm water, and by the internal use of tonics.

Though the amount of urine is not changed, its composition sometimes undergoes alterations which it is important to be acquainted with.

I shall not return to the consideration of the peculiar pellicle called kyesteine by M. Nauche, and whose diagnostic value we have already determined; but I shall proceed to notice a very remarkable fact, which we shall often have occasion to refer to; I speak of the presence of albumen, which is found in greater or less amount in the urine of some women at an advanced stage of pregnancy.

§ 3. Albuminuria. Uræmia.

The credit of having called the attention of physicians to the presence of albumen in the urine of pregnant women belongs to M. Rayer, whose admirable and laborious investigations of the disease of the kidneys have thrown so much light upon the pathology of those organs. He was the first to endeavor, in his splendid work, to determine the effect of this alteration of the urinary secretion upon the health of the mother, and the regular development of the fœtus. Afterward, followed the observations of Dr. Lever

and of Dr. Cahen, who, by the advice of his master, M. Rayer, published a good thesis upon the subject. Next came the interesting memoir of MM. Devilliers and Regnauld, and another thesis by M. Blot. More recently, two manuscript memoirs by MM. Imbert-Goubeyre, and Bach, and the researches of Frerich, Schott, and Wieger, have shed some light upon this still obscure point of puerperal pathology.

It is known that albuminuria is generally the symptom of an organic disease of the kidneys, which almost always proves fatal; hence, it may be readily understood, that when this change in the urine is observed during pregnancy, it becomes at once desirable to ascertain whether it be necessarily due to the same cause, or whether it be merely one of the numerous modifications produced in the economy by gestation.

In the first case, it is a very serious affection, calculated to awaken all the solicitude of the physician; in the second, it is but a temporary functional disorder, which will most probably disappear with the cause that produced it. Unfortunately, in the present state of our knowledge, it is very difficult to decide the question. For, on the one hand, 1. The normal diminution of the albumen in the blood of pregnant women, which diminution is much greater in patients affected with albuminuria, since MM. Devilliers and Regnauld have observed it to descend to 56·39, would lead to the supposition that the cases under consideration were but exaggerations of what ordinarily occurs, and that the elimination of a larger amount of albumen than usual from the blood, be the cause what it may, accounts for its evacuation by the urine. 2. The albuminuria of pregnancy is not generally accompanied by the functional disorders and the symptoms to which it gives rise when connected with disease of the kidneys; and the dropsy itself, which is almost constantly observed in the latter case, is sometimes wanting in pregnant women affected with albuminuria, as was twice observed by MM. Regnauld and Devilliers, as I have myself witnessed, and as M. Blot found to be the case twenty-three times out of forty-one. 3. Lastly, in the majority of instances, it disappears immediately upon the termination of the pregnancy which caused it; and when we consider the obstinacy of albuminous nephritis, it is difficult to account for this sudden disappearance of a disease, which, under other circumstances than the puerperal condition, so frequently has a fatal termination. On the other hand, however, observation shows that in almost all the cases in which women die of the convulsions which too frequently complicate albuminuria, the kidneys present the anatomical characteristics of albuminous nephritis, the more or less advanced degrees of alteration appearing to correspond with the duration of the disease and the amount of albumen discharged. Many times have I had occasion to observe this fact, and fearing lest I should interpret the alterations erroneously, have almost uniformly presented the kidneys to the examination of M. Rayer, who generally recognized in them the second, sometimes the third, and only once the fourth degree of alteration.

The learned physician of La Charité considers the more frequent occurrence of the anatomo-pathological characters of the second degree of the disease to be due solely to the recency of the latter, and by no means to a difference of nature. It is no less the consequence of a renal hyperæmia, which he supposes may be caused in many cases by compression of the emulgent veins by the enlarged uterus, and the consequent obstruction to the return of the venous blood. That, in simple cases, it generally disappears promptly after delivery, is probably due to the consequent cessation of the congestion of the kidney which was maintained by the pregnancy.

We see, therefore, that the question is far from being settled; whilst M. Blot, for example, regards puerperal albuminuria as generally unconnected with Bright's disease, M. Bach, of Strasbourg (Memoir, crowned by the Academy), thinks that it is only *sometimes* due to albuminous nephritis, and M. Imbert-Goubeyre (Memoir, crowned by the Academy) endeavors to prove that it is always a sign of Bright's disease. Now, is it impossible to throw a little light upon this question, which is still so obscure?

Healthy urine contains no albumen, and the same is true for the healthy woman in the puerperal condition. Albuminuria, therefore, always indicates a pathological condition of which it is the symptom; for every functional disorder, whether temporary or persistent, supposes a momentary or prolonged alteration of the organs whose office it is to accomplish the function. Therefore, the investigation of the causes of albuminuria implies that of the general or local affections which are capable of producing it. But lest we should go astray in these researches, it is very important to ascertain *a priori*, what are the organs upon which the accomplishment of the urinary secretion devolves. The kidney is supposed to be exclusively intrusted with this office, and thus it happens that the material explanation of all the disorders of the secretion is sought for in lesions of that organ. Now, as M. Pidoux has very judiciously observed, the secretion of urine is not confined to the kidney, since it takes place previous to the formation of the latter. (Uric acid and the other elements of the urine have been discovered in the fluid contained within the allantoid.) The process of assimilation, which is so active in the fœtus, can only be understood by supposing a contemporaneous process of decomposition. The blood which flows to the organ is already charged with the elements of urine which are to be separated from it in the passage. The function begins in all parts of the economy by this admixture of heterogeneous elements with the blood, and is completed in the kidney by their elimination from the circulating fluid, which is returned in a purified condition. M. Pidoux was therefore right in saying: that the secretion of urine is at once a local and general function; general, because it commences everywhere, and local, because it ends in the kidney. To study the latter organ exclusively, when we wish to obtain a physiological idea of the function, is to neglect an important element; so, also, in pathology, always to expect to find the cause of the disorders of the urinary secretion in alterations of the kidney, is to overlook a multitude of other causes which may have a corresponding influence. The elements of the blood conveyed by the renal artery exist, in health, in a fixed proportion, and certain of them are destined to be eliminated by the kidneys. Now it is easy to understand that if an alteration in the structure of these organs is capable of modifying both the quantity and quality of the matters eliminated, an alteration of the fluid, such, for example, as the diminution or increase of its solid or fluid parts, may also have the same effect. Clinical observation and post-mortem examination give constant support to this idea; for though we sometimes find a material lesion of the kidney to which we attribute the albuminuria, we are very frequently obliged to recognize the fact that it is very often absent.

[In the present state of knowledge in respect to albuminuria it cannot be regarded as the symptom of any one single lesion, the passage of albumen being due to many different causes, upon the nature of which great light has been thrown by physiological experiment. The most striking experiment is that of Claude Bernard, who, having injected a solution of the white of an egg into the veins of an animal, found that albumen soon made its appearance in the urine. The same result followed the injection of serum of blood. Albuminuria may also be produced artificially by feeding animals with albuminous matters exclusively. All these experiments prove that an excess of albumen in the blood is always followed by albuminuria. A somewhat similar excess is found in the blood of pregnant women, for, we have here to consider not the relative proportions of the water and organic matters, but rather the comparative relations of the two. Now Mr. Gubler states that such a comparison shows, as a general rule, a marked predominance of albumen as compared with the corpuscles. He therefore regards the proportionate super-albuminosis of the blood as the common determining cause of albuminuria. During pregnancy, continues this author, the mother's blood has to supply the fœtus with its nutritive materials, but only in a soluble and diffusible form, inasmuch as no inosculation exists between the maternal and fœtal vessels. Albumen in its various forms is, therefore, required for the nourishment of the new being, and whilst this is

the case the maternal organism has to provide for a double expenditure.

In consequence either of an increased ingestion or a more perfect appropriation of protein substances, or to both causes conjoined, a greater amount of albuminous matter is continually supplied. Now, under the changes impressed upon the functions, a bad state of the economy or the perturbations produced by the first efforts, so to speak, in this novel direction, may cause the albumen to accumulate in proportions beyond the needs of the two conjoined organisms.

In this view, the albuminuria of pregnancy implies an excessive production of albuminous matters in relation to the requirements of both mother and child. Sometimes it will be that the former produces too much, and sometimes that the latter appropriates too little; again, both these conditions may concur to produce the same result. Should the children, when born, be of the usual size and weight, it would be fair to conclude that the albuminuria resulted from disorder of the maternal economy; should they, however, be small and puny, it would be equally just to suppose that their condition may have caused the excess of albumen in the blood and its consequent filtration through the kidneys. We would add, as a fact shown by experience, that children born of mothers affected with albuminuria are often of less than the medium weight and development. The remarks of Danyau, Depaul, and Blot put the truth of the latter statement beyond a doubt. (Gubler.)

In connection with the superalbuminosis just discoursed of, we should consider the effect of the pressure of the blood upon the walls of the vessels as of no less importance in the etiology of the affection. If enough water be thrown into the vascular system to increase suddenly the mass of the blood and produce a strong vascular tension, albumen is found to escape immediately by the urine. A still more decisive experiment is afforded by ligating the emulgent vein. In this case, the sudden arrest of the venous circulation determines a progressive stagnation in the capillary vessels and albuminuria results. The same result is obtained if the ligature be gradually tightened, so that entire interruption of the flow of venous blood is not produced for several hours or even days. Whenever, therefore, sufficient pressure is made by a tumor upon the renal vein or vena cava inferior to slacken and obstruct the returning circulation in the kidney, the urine is liable to contain albumen. This, M. Jaccoud states, is the most frequent cause of the albuminuria of pregnancy. Generally, indeed, it does not begin until after the sixth month of gestation (Rosenstein, Braun), but then everything conspires to produce considerable obstruction of the abdominal circulation; that of the kidney is slackened as well as that of the liver or spleen (Virchow), and the pressure thus abnormally produced in the malpighian bodies leads to the passage of albumen into the urine. This view, now universally received (Frerichs, Braun, Rosenstein, Wieger, Beckmann, Krassnig, Brown-Sequard), is evidently not applicable to that kind of albuminuria which appears exceptionally during the last four months of pregnancy. At this period it can no longer be attributed to obstructed circulation in the renal veins, the pathological process being entirely different. (Jaccoud.)

Superalbuminosis, therefore, on the one hand, and great distension of the vessels of the kidneys on the other, afford a satisfactory explanation of the albuminuria of pregnancy; but are we to conclude that the kidneys themselves have nothing to do with the causation of the disease? Evidently not, for the albumen would remain imprisoned in the blood-vessels indefinitely, did not the kidney undergo such changes as would allow the protein matters to pass through it; that is to say, did it not become affected with active congestion and certain transient parenchymatous alterations which are the instrumental conditions of the disease. Co-operative circumstances, such as the impression of cold, might increase the hyperæmia to the state of inflammation properly so called, and thus give rise to what Gubler has termed *secondary albuminous nephritis*. In this case, the albuminuria is maintained by the kidney itself.

But this is not all. The kidney may also be the seat of the initial phenomena of the disease; which would then be due to a *primitive albuminous nephritis*.

To recapitulate: the albuminuria of pregnancy is produced by various causes, the principal of which, in our opinion, seem to proceed from and be connected with the three following conditions:

1. Superalbuminosis.
2. Over-distension of the blood-vessels of the kidneys.
3. Albuminous nephritis, which may be either primary or secondary.]

This succession of pathological phenomena seems to me to throw much light upon the etiology and nature of puerperal albuminuria, and to reconcile apparently contradictory facts and opinions. It were certainly going too far to say that all cases of albuminuria during pregnancy are attended with albuminous nephritis; it is an opposite exaggeration, on the other hand, to insist that there very rarely exists a connection between the albuminous urine and the disease described by Bright. The true statement, we think, would be: that pregnancy generally produces a notable change in the relative proportion of the elements of the blood, which change consists essentially in a diminution of the solid constituents, with relative predominance of albumen.

This general alteration is of itself capable of producing the elimination of albumen; but when existing in a slight degree only, and therefore unequal to the production of albuminuria, may have its action assisted by the active or passive congestions to which the kidney may be exposed during pregnancy, and especially during labor. Those simple hyperæmias of the kidney, which are so often seen after death, and which are really the first degree of granular nephritis, do not appear to have any other cause.

The marked influence which a first pregnancy appears to have in the production of albuminuria (the resistance of the walls of the abdomen increase greatly the pressure sustained by the parts situated behind the uterus) is thus explained, as also the rapidity with which the albumen frequently disappears after labor.

[According to most authors, the presence of albumen in the urine is almost always coincident with diminution of urea, which would even seem to lessen in quantity in proportion to the abundance of urine. The urea being imperfectly eliminated by the kidneys, therefore accumulates in the blood. For further discussion of this subject, see *Uræmia*, at the end of this article.

Let us now examine the methods of detecting the presence of albumen in the urine and the symptomatic troubles to which its existence there gives rise.

Notwithstanding all that has been said respecting the appearance of albuminous urine, its want of color, and the frothy bubbles which form on its surface, it would often pass undetected if care were not taken to examine it closely by peculiar processes. Many chemical reagents have been proposed for its analysis, but heat and nitric acid are almost the only ones to be relied on.

The simplest process for detecting albumen is as follows: having drawn the urine by a catheter in order to avoid the inconvenience of admixture with vaginal or lochial discharges, it should be poured into a tube and heated to the boiling-point. When ebullition commences, should the urine be albuminous, it grows cloudy, and a flocculent coagulum precipitates. It ought, however, to be understood that this coagulum is not a certain indication of albumen, since alkaline urine might precipitate its earthy salts. An opposite error might also occur, inasmuch as highly alkaline and at the same time notably albuminous urine contains but a small proportion of earthy salts and is not clouded by heat. In all cases, therefore, it is indispensably necessary first to test the urine by litmus-paper, and if alkaline to acidulate it with a small quantity of nitric acid; after which it should be subjected to boiling.

The testing by heat is liable to another objection, to wit, that urine which is albuminous but at the same time very acid, may not yield a precipitate by heat. The resistance to coagulation depends, in this case, according to Gubler, upon the presence of phosphoric acid. Here a little nitric acid, by neutralizing the influence of the phosphoric acid, restores to the albumen the power of coagula-

tion by heat. On the other hand, a still larger proportion of acid would precipitate the albumen directly, without the assistance of an elevated temperature.

Instead of having recourse to heat, albumen may be sought for in urine by allowing a few drops of nitric acid to flow down the sides of the glass containing the fluid. The acid coagulates the albumen and a flocculent precipitate soon forms.

This method, unfortunately, is not decisive, for the action of nitric acid upon cold and acid urine gives a precipitate of uric acid resembling considerably that of albumen. We may avoid deception, however, by warming the clouded fluid, which will resume its transparency as the temperature rises in consequence of the greater solubility of uric acid at high than at low temperatures.

All the preceding considerations show: 1st, that albumen may be supposed to exist when it is absent; 2d, that it may be overlooked when present. The testing for albumen is not so easy as is generally supposed. Therefore, it were better, for greater certainty, to examine first by boiling and then by nitric acid. All the difficulties presented by the analysis have been thoroughly stated by Gubler (*Dictionnaire Encyclopédique*), whose work we refer to without being able to enter at present into greater detail.]

The urine, in Bright's disease, presents other alterations besides its admixture with a certain proportion of albumen. Thus, when submitted to microscopic examination at a certain period of the disease, it is found to contain mucous corpuscles, scales of epithelium derived from the bladder, ureters, and pelvis of the kidney, besides elongated cylindrical bodies formed of amorphous fibrin, in the substance of which blood-corpuscles may be observed, either singly or in groups. These have been termed fibrinous cylinders, and are regarded by Frerichs as pathognomonic of Bright's disease.

According to some authors, all these peculiarities are observable in the urine of pregnant women affected with albuminuria; according to others, on the contrary, the fibrinous cylinders are very rare in the latter case, and M. Blot has quite recently examined the urine of three eclamptic patients without discovering them.

I am not prepared to decide upon this point, though it seems to me very probable that this difference of results is simply due to the fact that, in the first case, the kidneys were diseased, whilst in the second the recent albuminuria was connected only with a general alteration of the fluids.

After the indications afforded by examination of the urine, the next most frequent symptom of albuminuria is general infiltration or anasarca, which must not be confounded with œdema of the lower extremities. The latter is occasioned simply by the mechanical obstruction of the venous circulation produced by the pressure of the gravid uterus.

General infiltration is not so uniform an accompaniment of albuminuria as I thought formerly. In order to determine its relative frequency, it is necessary not only to examine the urine of infiltrated females, as was my practice, but to investigate carefully the urine of all pregnant women, as was done by M. Blot. It will then be discovered that many patients with albuminuria present not a trace of œdema. M. Blot found it, we have said, in 23 cases out of 41.

It is proper to observe, that this absence of infiltration is also often noticed in the ordinary Bright's disease. By a collection of observations with autopsies, derived from various authors, Frerichs found that, of 220 cases of Bright's disease, 175 were accompanied with œdema, and 45 were free from it.

Nervous disorders are sometimes attendant upon the anasarca.

In the last edition of this work we stated that puerperal albuminuria did not usually give rise to the symptoms which accompany Bright's disease. This is true for the light cases, which, happily, are the most frequent; but science has progressed, and modern researches have proved that certain of the affections of the pregnant female, whose cause and nature were entirely unknown, coincide with albuminuria, and very probably are, like it, the consequence of extensive elimination of albumen from the blood. Thus, in several cases of amaurosis occurring during pregnancy, MM. Simpson, Imbert-Goubeyre, and others, have detected albumen in the urine. The same is true of certain cases of obstinate headache, of lumbar pains and pleurodynia, of paralysis (hemiplegia or paraplegia), (Robert Johns, Simpson, Imbert-Goubeyre), and of contractions, hemorrhages (Blot), etc. Now, M. Imbert-Goubeyre's remark is very important, namely, that all these phenomena are found in the symptomatology of Bright's disease, which confirms the comparison that we have made.

To the symptoms just mentioned we might add eclamptic convulsions, which are, happily, quite rare, and hardly ever appear, except at an advanced stage of the disease. We shall treat of them at length hereafter.

It is very difficult, not to say impossible, to determine with certainty when the albuminuria commences; to do this, it would be necessary to examine daily the urine of a large number of women during the entire period of pregnancy. Hitherto, it has generally been observed only during the latter months. M. Bach, of Strasbourg, however, says that he has seen it at six weeks in a very nervous person. I once detected it at four months in a greatly infiltrated primiparous female, who was delivered at six months of a still-born child, and whose urine was slightly albuminous eighteen months afterwards, although the infiltration had disappeared since six months. M. Cahen mentions in his thesis three cases, recorded in the fifth and sixth months, and M. Bach two others. Perhaps, now that attention is directed to this point, such facts will multiply; but those observed hitherto have almost always been noticed in the latter stages. Sometimes it appears only at the moment of delivery, under the influence of the parturient efforts, which are well calculated to produce congestion of the kidneys.

When once begun, the progress of albuminuria is liable to great variation; sometimes it continues uninterruptedly until the commencement of labor, and increases during its continuance; at others, it varies greatly in intensity, and may even cease completely for several days, then reappear, and again stop at very indefinite intervals.

When it begins during labor or shortly before, it often disappears a few hours or days after delivery; but it follows from the facts collected by M. Imbert-Goubeyre, that so prompt a cessation is not as common as I had thought, and as M. Blot had stated. Though there are cases, says M. Imbert-Goubeyre (memoir quoted), in which the albumen disappears with rapidity, in others it continues, and passes into chronic and confirmed Bright's disease. From a statement by this author, it appears that, of 65 cases of puerperal albuminuria unaccompanied with eclampsia, 21 proved fatal during pregnancy and the lying-in; and 6 from the third to the fourteenth month after delivery; 5 cases became chronic, and were found to be still existent, two, eight, ten, and fourteen months, and seven years after the labor.

I but just now mentioned a case in which albumen was detected in the urine eighteen months after delivery.

These differences appear to me to be due to the greater or less intensity of the disease. When the alteration of the fluids is but slight, especially when it has existed for but a short time, and occurs towards the end of gestation, or only during the labor; when, finally, the active or passive congestion of the kidneys, produced by obstruction of the venous circulation, has had its influence in causing the albuminuria, we can understand how the removal of one of the causes, by delivery, may leave the other incapable of sustaining the functional disorder. But when the alteration is slight, especially when it dates back to the middle or first half of the pregnancy, it may then continue for a long time after delivery. In these latter cases, granular nephritis is often present; but I am much inclined to believe that sometimes the kidney is unchanged, or very slightly altered, notwithstanding the persistence of the albuminuria.

In respect to the prognosis, the coexistence of an alteration of the kidney is of the highest importance; unfortunately, however, the diagnosis during life of this organic lesion is extremely difficult, inasmuch as none of its symptoms are pathognomonic. It would appear, however, from the researches of M. Pickard (thesis, Strasbourg, 1856), that great light may be thrown upon the question by analysis of the blood, since, when the kidneys are diseased, the blood contains an amount of urea much greater than in any other cases of albuminuria; moreover, the quantity of urea is proportionate to the greater or less advanced degree of renal alteration, a very small proportion of urea in the blood generally coinciding with simple congestion of the kidneys.

Has the albuminuria any effect upon the progress of the pregnancy, and upon the life and development of the fœtus? M. Blot thinks that it has not, whilst MM. Cahen, Rayer, and some others, hold the contrary opinion.

I still regard the view of M. Blot as entirely correct for the slight cases, which are, I repeat, the most common; but it does not appear to me well founded as regards those complicated with anasarca, or which begin before the latter half of gestation. I am very much inclined to consider it as being then a frequent cause of abortion, of premature labor, and of death to the fœtus.

We have noticed the views of Simpson and others respecting the frequent occurrence of albuminuria in numerous puerperal disorders. M. Blot considers it a cause of hemorrhage. It is, therefore, as relates to the prognosis, a sign which is always calculated to excite solicitude. As a diagnostic sign it is certainly destined to reveal the nature and etiology of a multitude of affections hitherto of very difficult explanation; therefore, it is now indispensable, in obscure cases, to examine carefully the urine of pregnant women, even when unattended with dropsy. It may possibly be shown in the future that albuminuria is a central point towards which converge a multitude of diseases of various characters, and these researches may throw light upon their treatment, which is still so obscure.

If we have succeeded in showing that an altered state of the blood is the principal cause of puerperal albuminuria, and that this alteration consists chiefly in a diminution of its solid constituents, we shall have no occasion to insist strongly upon the advantages of a reparatory treatment. Unless very evident symptoms of general plethora or renal congestion be present, bleeding would be rather hurtful than useful, in a disease attended with so great impoverishment of the system; therefore a tonic medication should be resorted to from the outset. A good animal diet, assisted by the use of whatever ferruginous preparation will be most readily supported by the patient, ought evidently to form the basis of the treatment. The preparations of Peruvian bark, and other bitters, may be added with advantage.

[*Uræmia.*—We have just said that albuminuria is often accompanied by various nervous disorders (amaurosis, paralysis, eclampsia), the production of which it is very difficult to explain satisfactorily. It will not, however, be forgotten that albuminous urine contains but little urea (see page 74), which being no longer eliminated by the kidneys, must necessarily accumulate in the blood. This fact is supposed to account for the nervous disorders in question, by giving rise to a peculiar poisoning to which the name uræmia is applied. We propose now to state the principal points and successive phases of the doctrine of uræmia, premising, however, that it is liable to numerous objections.

Wilson first, and afterwards Rayer, attributed the nervous complications of albuminuria to the presence of urea in the blood. At first accepted without limitation, this opinion was soon attacked in its very foundation. Cases were cited in which urea was present in large amount in human blood without being attended by any of the so-called uræmic symptoms. Finally, Cl. Bernard, from experiments made by injecting urea into the blood of animals, came to the conclusion that urea is incapable of producing the nervous accidents of albuminuria. Thus Wilson's theory was ruined.

Frerichs came, for a while, to the rescue of the doctrine of uræmia by explaining the facts differently. According to him, urea is, of itself, innocuous, the danger arising from the fact that it is easily decomposed in the blood, giving rise to carbonate of ammonia, which really is poisonous. Frerichs' experiments appeared to be decisive. He injected carbonate of ammonia into the veins of dogs in good health, and after a very short time the expired air contained carbonate of ammonia, and the animals were soon taken with convulsions and coma. The symptoms thus artificially produced bore a strong resemblance to eclampsia, and Frerichs' position seemed for a time to be thoroughly established. It was thus presented in a favorable light in former editions of this work, but since then it has lost ground and its partisans become daily less numerous. The fact is, that the theory is not free from objections; and out of a great number of experiments which go to contravene those of Frerichs, I again cite the opinion of Bernard, which is far from being favorable. This celebrated physiologist asserts that carbonate of ammonia is almost always present in human blood, whether in health or in disease, and the experiments which he undertook satisfied him, moreover, that it is far from being productive of the terrible nervous symptoms which have been attributed to it. "If," says the learned professor, "carbonate of ammonia be injected in small quantity, it produces no effect. When thrown in larger amount into the blood of a dog, the animal cried and was extremely agitated for a considerable time: nevertheless it recovered." From these experiments Bernard concludes that eclampsia cannot be explained by carbonate of ammonia. The same opinion is given in the excellent thesis for the Concours, of my colleague Dr. Fournier; and, for my own part, I would say with him that Frerichs' doctrine, ingenious and learned though it be, will not bear severe scrutiny. (Fournier, *Thèse de Concours pour l'Agrégation*, 1863.)

At present, the position can no longer be sustained that uræmic symptoms are due to the presence in the blood of any single principle, whether urea or carbonate of ammonia. Schottin assumes that substances imperfectly known as yet, and vaguely styled *extractive matters*, may accompany the urea, remain in the blood, and give rise to a poisoning which Gubler proposed to call *urinæmia*. This last mode of interpreting the facts is an approximation, perhaps, to the truth, though it is far from proven that it represents it precisely.

"If the doctrine of uræmia or of urinæmia be accepted as true, how shall the nervous troubles which it produces be explained? Here come in what have been termed the nervous theories of uræmia. Certain authors, as Traube and Sée, regard the nervous phenomena of uræmia as somewhat analogous, as respects the intrinsic mode of production, with the pathogenic process which Kusmans, Tenner, and others assign to epilepsy. Through some change in the blood an excitement is produced of the vaso-motor nerves and the cerebral arteries. These arteries contract, and there result either oligæmia of the medulla oblongata giving rise to convulsions, or the same condition of the encephalon giving rise to coma." (Fournier, *Thèse de Concours.*)

In short, the clinical facts are real, and all physicians have occasion to see how frequently nervous troubles arise in the course of an attack of albuminuria. How shall they be explained? Though the question seem at present to be unanswerable, I have deemed it my duty to exhibit the present state of knowledge on the subject. Should the doctrine of uræmia be false and that of urinæmia doubtful, plausible hypotheses would still remain whereby to explain the nervous disorders complicating albuminuria. Other changes in the blood, altered nutrition of the nervous tissue (Gubler), hyperæmia or anæmia of the encephalon, serous effusions upon the surface of or in the cavities of the brain (Rilliet, Natalis Guillot), and œdema of the cerebral substance, are all circumstances capable of explaining the convulsive phenomena and concomitant symptoms observed in certain forms of albuminuria. (Gubler.)

One other difficulty remains to be mentioned. What are the nervous disorders observed in cases of albuminuria? In the first

place we would mention cephalalgia, troubled vision and hearing, vomiting, coma, and eclampsia. Up to this point there is no disagreement. But are cases of paralysis like hemiplegia or paraplegia ever witnessed? Here is a case of controversy: Churchill and Imbert-Goubeyre on the one hand admit that puerperal paralyses are not uncommon; whilst on the other almost all pathologists, Addison, Sée, Lasègue, Fournier, and Grisolle, remark that paralysis has no place amongst the nervous disorders of albuminuria. When hereafter we come to study puerperal paralysis and include uræmia in their etiology, we shall not lose sight of the difference of opinion upon this subject.

In short, various nervous affections occur in women affected with albuminuria, to explain which the doctrine of uræmia and urinæmia has been invoked, although confidence in it has become very much shaken. All our knowledge on the subject is hypothetical, and further investigation is indispensable to reduce it to any certainty; therefore, whenever we shall mention uræmia in explanation of any pathological condition, our reservation on the matter will be brought to recollection.]

§ 4. Dropsy of the Cellular Tissue.

Another affection of quite frequent occurrence, and one which is often connected with what accoucheurs call plethora, of which, according to Chaussier, it is a variety (serous plethora), is serous infiltration of the cellular tissue. This infiltration begins in the feet, then extends to the legs, thighs, genital parts, and sometimes rising above the lower extremities invades the trunk, face, upper extremities, and is sometimes even accompanied by effusion into the great serous cavities.

These dropsies, upon which MM. Devilliers and Regnauld have published an interesting memoir, are by them divided into: 1, simple œdemas; 2, œdemas connected with affection of the central organs of respiration and circulation; 3, œdemas with albuminuria.

The œdema connected with lesions of the organs of circulation generally increases during pregnancy, but this increase is especially due to the unfortunate influence which gestation has upon all organic lesions, and we have no occasion to speak of it further. As regards the two other species, we think it proper, in order to avoid repetition, to include them in the same description; for though they have some special characters upon which we shall have to insist, they resemble each other in a great many particulars.

The *causes* of the serous infiltrations which occur during pregnancy may be divided into general and local. As first in importance of the general causes, we must rank the decrease in the proportion of albumen; a decrease which has been discovered by all observers in the blood of pregnant women. According to M. Andral, this special alteration of the blood is the only one which necessarily produces dropsy. The amount of effusion is dependent upon the extent of the alteration, which, if considerable, is often attended with albuminuria.

Hydræmia, or serous plethora, which also produces œdema in certain chlorotic patients, may also give rise to the same symptom during pregnancy, and assist in the production of serous infiltrations. When these general alterations of the economy are but slight, they usually would be unequal to the production of œdema, did not the development of the womb add its local action to their own.

The pressure of the womb upon the surrounding parts from early pregnancy, and the obstruction which it occasions to the performance of the functions of the central organs of respiration and circulation at an advanced stage, when by rising into the epigastric region it forces up the diaphragm and thus diminishes the thoracic cavity, explain why the œdema commences in the lower extremities, and why it generally does not extend until a much later period to the trunk and upper extremities.

Progress and Symptoms.—Generally speaking, the œdema makes its appearance within the last three months of pregnancy, especially when it appears to be due simply to a mechanical obstruction of the circulation. But when it results from one of the general causes before mentioned, it may commence with the pregnancy, or in the third or fourth month. However, as hydræmia, the diminution of the albumen of the blood, and the albuminuria, are most generally observed in the latter half of gestation, we may understand that the dropsy to which they give rise should also be more common towards the seventh, eighth, or ninth month.

The progress of the œdema of pregnancy is generally slow and chronic; sometimes, however, it advances rapidly in a few weeks. Whatever may be the case in this respect, it generally begins by the lower extremities; sometimes affecting one of them, at others both. At first it is limited to the feet and neighborhood of the ankles; sometimes even it never gets farther than the lower part of the legs, though quite frequently it reaches the knees, the thighs, and external genital parts. Occasionally it invades the integuments of the lower part of the trunk, and in some rare cases, generally attended with albuminuria, it affects even the face and hands.

In the early stages, while limited to the lower part of the legs, it disappears at night, in consequence of the horizontal position, and is only well marked towards the close of the day. But when the disease has advanced farther it continues, whatever position the patient assumes; and although the horizontal posture seems to diminish the swelling of the legs, it is only because the infiltrated fluid is displaced to the lower part of the trunk.

The amount of fluid extravasated varies between a slight puffiness and the extreme swelling which makes standing and walking impossible. In the latter case, the parts affected are generally the seat of pain, of sensations of pricking, and sometimes of burning and extreme tension.

The œdema rarely disappears before delivery; on the contrary, it generally increases until near the end of pregnancy. Sometimes, however, as MM. Devilliers and Regnauld have indicated, it undergoes remarkable variations. Thus, it may disappear entirely and finally, or it may return shortly after; sometimes it is observed to leave one member and fix upon the other, which had been but partially affected. These changes are doubtless owing to mechanical causes, the action of which varies or ceases with alterations in the situation of the uterus (Devilliers and Regnauld); but they certainly may also be occasioned by fluctuations in the albuminuria, which may be suspended for a short time and then reappear, as I have witnessed in one case after labor.

Terminations.—The dropsy of pregnant women, however caused, generally disappears quickly after labor; and in cases of albuminuria, the secretion of albumen often ceases with equal rapidity.

Prognosis.—If the dropsy be viewed as a simple fact, independent of the complications which so often attend and follow it, it assumes the position of a merely troublesome affection; but to appreciate the prognosis rightly, it is important to remember that some authors regard the œdema as favoring abortion and premature labor. They also suppose it to be almost uniformly connected with the etiology of eclampsia, and often with the development of puerperal fevers; and finally, that sometimes the disappearance of the effusion after delivery has been followed by a frequently fatal serous congestion of the nervous centres or respiratory organs. The facts related by M. Lasserre leave no doubt in my mind of the truth of the latter proposition. It is especially important to bear in mind, that although these dangerous complications are possible as a consequence of simple œdema, they have been chiefly observed in cases of albuminuria with infiltration, and consequently that the presence of albumen in the urine adds greatly to the gravity of the prognosis. Hence the interest which then attaches to the examination of the urine.

The *treatment* of the dropsy of pregnant females should be conducted with the double purpose of overcoming the organic cause which so frequently produces the œdema, and to stimulate the absorption of the effused fluids. The preparations of iron and a tonic regimen appear to me to be especially called for in a disease which is so frequently connected with hydræmia. The presence of albumen in considerable quantity, even supposing it due to a nephritis, does not contraindicate this treatment. The antiphlo-

gistics recommended by some authors seem to me likely to be more hurtful than useful; and unless the patient suffers very severe lumbar pains, or to the general infiltration are superadded dyspnœa, palpitations, extreme giddiness, and especially evident indications of uterine congestion, threatening abortion, I should think it right to prescribe bleeding. Even under the latter circumstances, I would employ it less as an antiphlogistic than as a revulsive, nor would I discontinue the use of the iron.

To assist the absorption of the effused fluids, mild laxatives, diuretics, and dry frictions may be used. To these may be added vapor-baths, provided the patient is able to bear them without danger of cerebral congestion.

If the distension and size of the lower extremities is so great as to make walking impossible and cause great suffering, and if the genital parts are greatly swollen, their disengorgement may be facilitated by practising small incisions, or, at least, a number of punctures, with the lancet or a needle. In several cases I have derived benefit from keeping compresses, saturated with cold water, applied to the limbs for several days. Levret advises blisters between the thighs and external labia, aided by slight punctures on the feet; but inasmuch as the application of blisters upon a highly œdematous limb is sometimes attended with serious consequences, I think it prudent to abstain from them.

§ 5. Ascites.

We have already stated, that dropsy during pregnancy was so far from being limited to the subcutaneous cellular tissue, that collections of fluid of variable amount might take place in the great cavities of the body. The effusion within the abdomen may occupy different locations: thus, it may accumulate within the amnion, and constitute dropsy of the amnion; or between the membranes of the ovum and the internal surface of the womb, in which case it furnishes the fluid that gives rise to hydrorrhœa; finally, by collecting within the cavity of the peritoneum, it forms a true ascites.

Either of these varieties of dropsy may occur separately, or two of them may coexist in the same female, as is often the case with ascites and hydramnion. We shall treat first of ascites.

This affection sometimes makes its appearance in the first half of the pregnancy, though usually towards the fifth or sixth month, rarely later. When the accumulation begins very early, it sometimes progresses so rapidly that the abdomen is larger at the fifth month than at the usual term of gestation, and as the infiltration of the lower extremities generally keeps pace with the effusion in the abdomen, the patients find it impossible either to walk or pursue their occupations.

The progress of the ascites increases rapidly; the face is puffed and livid; the abdominal walls, much thickened by infiltration, add to the size of the belly; the skin covering them, although distended and shining, sometimes has a tuberculous appearance, as in elephantiasis. The umbilicus usually forms a smooth, rounded, translucent tumor, of the shape and size of a hen's egg, at the base of which the umbilical ring may be felt, though it is too much distended to produce any circular constriction.

The greater labia share in the general infiltration, are enormously swollen, and affected with a painful irritation, produced by their constant friction against each other, and contact with the urine.

The skin of the lower extremities is so distended as to seem ready to burst at several points, and is exceedingly painful.

The progressive accumulation of fluid in the cavity of the peritoneum soon obstructs the regular performance of the thoracic functions; the dyspnœa becomes extreme, the respiration very short, wheezing, and painful; the patient is obliged to remain seated night and day; yet, notwithstanding this position, the hæmatosis is so imperfect that she seems threatened with suffocation at every instant, and has frequent attacks of faintness. The suffering condition is aggravated by almost constant insomnia, intense headache, extreme thirst, and disgust for food.

Percussion of the abdomen detects readily the presence of a large amount of fluid in its cavity, though the fluctuation is not equal in all parts of it. As Scarpa remarks, it is slight or absent in the hypogastrium and towards the flanks, is manifest near the hypochondriac regions, and very well marked in the left hypochondrium, near the edges of the cartilages of the false ribs.

The enormous distension of the parietes of the abdomen frequently prevents the uterus from being felt, and its elevation determined with precision. The motions of the child, though generally obscure, are, however, still perceived by the mother.

The prognosis of ascites complicating pregnancy is grave in proportion as it dates farther from the term of gestation. When it appears only in the latter months, there is every reason to hope that, notwithstanding its rapid progress, it will be arrested by delivery, before producing such disorders as seriously to compromise the life of the mother, and that, as in the observation of M. Prestat, the recency of the effusion will render its absorption easy after delivery. But when the ascites begins within the first half of the pregnancy, there is great cause for fear, should it progress rapidly, lest paracentesis should be demanded long before the ninth month. It were useless to add, that the prognosis will be far graver, if, as unfortunately very often happens, the ascites should coexist with dropsy of the amnion. If, says Scarpa, there should fortunately be no uterine dropsy, the paracentesis may allow the pregnancy to progress favorably through its usual stages; but, under the opposite circumstances, it almost always happens that the womb, being excited by sympathy, contracts, and delivery follows.

Treatment.—The general bleeding, purgatives, and diuretics, employed with the design of retarding the advancement of the disease, have not seemed to influence its later progress, and it is conceivable that a too long-continued use of them might be prejudicial to the pregnancy. They should, therefore, be resorted to with the greatest reserve, and relinquished as soon as found to be unsuccessful.

When the disease has increased to such an extent as to threaten the life of the patient, it is evident that the only resource consists in the evacuation of the fluid. But where should the puncture be made?

The development of the uterus makes it impossible to insert the trocar at the place of selection in ordinary ascites. From the circumstance of the fluctuation being particularly well marked in the left hypochondrium, the prominence of which was greatest near the edge of the false ribs, Scarpa introduced his instrument between the uppermost part of the external border of the rectus muscle and the edge of the false ribs in the left hypochondrium. The patient aborted two days after, and recovered.

George Langstaff made an incision two inches above the umbilicus, exposed the peritoneum, and punctured it with a medium-sized trocar, being careful to introduce it but a short distance so as not to wound the uterus. He had thus given issue to about ten pints of fluid, when the womb came in contact with the end of the canula, interrupting the flow, and occasioning so much pain as to oblige him to withdraw the instrument. As the patient was unable to endure any pressure, he introduced a medium-sized gum-elastic catheter by the opening, directing it between the peritoneum and the anterior surface of the uterus. *Peritonitis followed eight hours after the operation;* three days subsequently to the operation she aborted, and three weeks later she was well.

Finally, in a case in which a considerable tumor existed at the umbilicus, Ollivier, of Angers, was decided by the tension and thinness of the skin at the part to make use of the lancet simply. This instrument was introduced in the same manner and to the same depth, as for bleeding, at the middle and front part of the tumor, at the distance of half an inch from the circumference of the ring. The water flowed immediately to the amount of sixteen pounds.

For twelve days the serum continued to flow by the little wound, which was closed hermetically on the thirteenth. The patient, who had been relieved at once, experienced a return of the accidents with the fresh accumulation of fluid. Twenty-eight days after the first puncture, it became necessary to repeat it; eight

pounds of fluid were discharged, and the same alleviation followed. Twelve days after this the woman was delivered of a living, though feeble child, and in fifteen days was discharged cured.

This simple process, consisting of a small puncture with the lancet, seems to me preferable to Scarpa's operation in the hypogastrium. The latter might, in some cases, endanger important organs, and could only be preferred on account of the existence of an old umbilical hernia with adhesions of the intestines to the sac. The presence of this complication can be readily discovered by holding a candle behind the thin and transparent walls of the umbilical tumor, as for the diagnosis of hydrocele, when the opacity of the exomphalos will be at once detected.

There is no advantage in placing a foreign body in the small opening, since the flow of serum keeps the sides separated, and the density and extreme thinness of the walls of the tumor prevent infiltration of the abdominal parietes. The observation of Langstaff, above cited, as also another fact related by M. Danyau, prove that the introduction of a foreign body exposes to peritonitis.

When the pregnancy has made but slight progress, the only resource evidently consists in the puncture; but when the ascites endangers the mother's life only at the eighth or ninth month, is it allowable to think of premature artificial delivery?

If the uterine dropsy, of which we are about to speak in detail, complicates the ascites, and we are able to ascertain that the sufferings of the patient are in good measure due to the extreme size of the uterus, I think the tapping would be insufficient, and that the artificial induction of labor may be attempted with advantage; still, though common, the hydramnion is not a necessary complication, and it seems to me that ascites can very rarely require premature delivery.

In the eighth, and especially the ninth month, the evacuation of the peritoneal fluid will afford sufficiently lasting relief to enable the woman to reach the regular term of pregnancy; or, at least, it will rarely be necessary to repeat the operation more than once. Such was the case with the patient of Ollivier. The only fault to be found with the puncture is that of being merely palliatory, whilst it exhausts the strength if frequently repeated. But should the relief afforded be such that one or two punctures enable the patient to reach the end of the ninth month with moderate suffering, I see no reason for not preferring it to premature delivery, which always places the child in unfavorable conditions.

ARTICLE V.

LESIONS OF INNERVATION.

[§ 1. Eclampsia.

On account of its danger and the nature of the convulsions which characterize it, eclampsia takes the foremost rank in the diseases of women. It is liable to appear suddenly either during pregnancy, at the moment of delivery, or subsequent to the removal of the placenta; it occurs, however, more frequently during labor, and will, therefore, be studied in connection with the accidents of dystocia.

§ 2. Vertigo. Giddiness. Lipothymia. Syncope.

These affections are due to various causes. Usually they seem to depend upon great nervous susceptibility, occasioned by pregnancy and heightened by chlorosis; less frequently they result from plethora, in which case blood-letting becomes, exceptionally, the best method of treating them. Sometimes, also, vertigo and giddiness accompany albuminuria, and precede eclampsia. (See *Albuminuria.*) In the majority of cases, neither plethora, albuminuria, nor eclampsia are observed in connection, so that the above-named affections seem to be due simply to a perverted action of the nervous system; an unsatisfactory explanation, but really the only one which can possibly be given.]

Thus some delicate, nervous women are subject to faintings, from the most trifling cause, when they are pregnant; any strong moral impulses, such as joy, or anger, and sometimes even an odor that is a little too penetrating, or the sight of an unpleasant object or person, may give rise to this condition. Gardien relates an instance, where the simple movements of a child produced swoonings; and I have attended a lady who fainted three or four times a week, during the second, third, and fourth months of her gestation, without any satisfactory cause being discovered for it.

Ordinarily, the syncope attacks the woman when standing, and she at once experiences a ringing in her ears, vertigo, dimness of vision, weakness in the knees, and she has scarcely time to sit down, before she faints away. Some females, however, are warned of the attack by the occurrence of yawning, and a sensation of heat in the precordial region; soon after, the extremities become cold, the face grows pallid, and is covered with a cold sweat; the senses and intellectual faculties are almost lost, the pulse and respiration have nearly ceased, though a total loss of the intelligence and sensibility is very rare. For my own part, I have never seen any woman in this latter state, since nearly all those whom I have carefully questioned on the subject have stated that they had a confused idea of what was passing around them; and therefore, if there really be any instances of a complete abolition of the faculties, they certainly are not so frequent as the authors would have us believe.

While the syncope lasts, we should employ the ordinary means, such as ammonia, vinegar, cold water, etc., etc. The tonics combined with anti-spasmodics have been recommended for its prevention: for instance, Van Swieten highly extols the use of orange-peel with canella, or lemon-rind and canella, in the proportion of two or three drachms to three pounds of sherry-wine, of which three or four tablespoonfuls are to be taken daily. Chambon has employed an infusion of peach-blossoms with success. All these nervous disorders are more alarming than serious. We have never known them to endanger the life of the mother, or to disturb the regular course of gestation.

The attacks of fainting, though generally short, are sometimes quite prolonged. In the latter case, they are frequently accompanied or followed by some hysterical symptoms, as sense of oppression, hypogastric pain, constriction of the fauces, and sometimes true hysterical convulsions. In the case of a young lady, a patient of M. Rayer's, these symptoms occurred almost every evening after dinner, during the last three months of her pregnancy. They had no serious consequence, unless a threatening of premature labor towards the end of the eighth month be so regarded, which, however, yielded to a small bleeding and opiate injections.

[§ 3. Various Forms of Neuralgia. Odontalgia.

Various forms of cephalalgia and obstinate hemicrania are often observed during pregnancy. Other neuralgias may also occur with their usual symptoms in various situations. The sensibility of the skin sometimes becomes so acute that the slightest touch gives pain; again there may be the sensation of intense heat in the feet and hands, or else an impression of cold which nothing will remove. (Jacquemier.)

Odontalgia is the most common of all the neuralgias of pregnant women. The lower jaw is the one usually affected, the pain sometimes invading one side, sometimes both sides together. It usually occurs during the first half of gestation, not unfrequently commencing shortly after conception, of which it is sometimes the first sign. It commonly ceases from the fourth to the sixth month.

It were not exactly correct to say that every case of odontalgia is a true neuralgia, inasmuch as it is often occasioned by a carious tooth. It therefore becomes necessary, in view of treatment, to make a correct diagnosis, and, in order to do so, to give the mouth a very careful examination. (Churchill.)

Mauriceau considered bleeding the best remedy for the toothache of pregnant women, yet it is a measure by no means certain, and in some cases entirely inadmissible. It is recommended to guard against constipation by the use of mild purgatives taken at short intervals, and as local applications, the use of gargles containing

opium, and plasters of opium and hyoscyamus. Internally, some of the preparations recommended for facial neuralgias may be tried; such as pills of cynoglossus or Meglin's pills. Should the paroxysms and remissions be well marked, and more especially should there be an actual intermission, the best effects might be anticipated from the use of quinine. No active measures should be resorted to unless the pain be very great, depriving the patient of sleep and rendering mastication almost impossible, for the contact of foreign bodies with the teeth is sometimes insupportable (Jacquemier). Capuron says that toothaches which had resisted all kinds of remedies have been known to subside spontaneously about the third or fourth month of gestation.

Should the gums be inflamed, one or more leeches might be applied. If the trouble is occasioned by a carious tooth, efforts should be made to relieve it by the measures commonly employed, the best being cauterization of the offending tooth. As most authors think that extraction might cause abortion, it would be well to advise patients not to undergo the operation.

§ 4. Paralysis.

Pregnant women are not exempt from the causes which produce paralysis under ordinary circumstances, but are even more liable thereto than other females of their age. That such is the fact the recent researches of Fleetwood Churchill and Imbert-Gourbeyre have established beyond a doubt.

Churchill reports 34 cases of paralysis derived from various authors or observed by himself. In 22 of them, the attack occurred during pregnancy, and in the remaining 12 either during or after labor. The location of the paralysis is noted as follows: 17 cases of complete hemiplegia and 1 in which it was partial; 4 of paraplegia, in 2 of which but one leg was paralyzed; 6 of facial paralysis, 3 of amaurosis, and 3 of deafness; in some of the latter cases, however, the local affection was connected with hemiplegia. Of these 34 cases, 4 were fatal.

Of the 22 cases occurring during pregnancy there were 12 of hemiplegia, 1 of paraplegia, 4 of facial paralysis, 2 of amaurosis, and 3 of deafness. Analysis of these cases shows no regularity in regard to the period of gestation at which the attack occurred, though it seems that the patients were more liable to the affection during the latter months. Most of them recovered before or after delivery, though some continued to be affected for a considerable time. But one case was fatal, and in this it was evident that the result was due to a disease of the brain antecedent to the pregnancy rather than to the paralysis which had increased during the latter; so that this single case by no means invalidates the conclusion as to the relatively trivial character of these attacks during pregnancy.

It is often very difficult to determine precisely the influence which pregnancy may have in the production of the paralysis. In our brief exposition of the state of knowledge on the subject, we shall have in view only such cases as occur during pregnancy, and thus endeavor to avoid being led off into the general subject of internal pathology.

The causes of puerperal paralysis are various; in the first place we would mention cerebral apoplexy, which is not very uncommon in pregnant women. Ménière reports in his excellent treatise several cases of the kind, and, at a later date, M. P. Dubois, whilst discussing the subject in a clinical lecture, came to the conclusion that the frequency of its occurrence proves the existence of some connection between it and the pregnant condition. How then shall the connection be explained? By plethora or hypertrophy of the heart? Both these views could doubtless be well defended, but M. Imbert-Gourbeyre believes that the apoplexy is due to albuminuria, which is well known to be common during gestation. He cites in support of his view several cases of Bright's disease which terminated in cerebral hemorrhage, and calls to mind that it is by no means a rare attendant upon eclampsia. More well-observed cases are necessary to enable us to determine conclusively the value of this opinion.

According to Churchill and Imbert-Gourbeyre, uræmia is almost the only cause of puerperal paralyses, such as amaurosis, deafness, and hemiplegia. As regards amaurosis and deafness, we freely accept their opinion, but we have some doubt as regards hemiplegia. Most authors, in fact, think that uræmia never occasions either hemiplegia or paraplegia (see *Uræmia*), but however this may be, the so-called uræmic paralyses sometimes accompany an attack of eclampsia or else are preceded by it.

After cerebral hemorrhage and uræmia, anæmia deserves to be mentioned, as also hysteria, a reflex action whose point of departure is located in the uterus, but whose influence extends to the spinal marrow;—rheumatism, etc., may also be noted as causes.

We have thus endeavored to show that the causes of puerperal paralyses are both numerous and variable, so that it will be evident that the prognosis and treatment will have to be modified in the different cases. The ordinary rules of pathology must serve as a guide in the course of medication to be followed.

1. *Amaurosis,*—which is of common occurrence in cases of albuminuria.

It varies in degree from the slightest amblyopia to perfect blindness. It usually affects both eyes, though Imbert-Gourbeyre says that he has known but one eye to be involved. Though generally of short duration, it may sometimes become permanent and incurable. It may also be the first symptom to call the attention of the physician to the possible existence of albuminuria, and is therefore of the greatest value as a premonitory symptom in the diagnosis of eclampsia (see *Eclampsia*). It may make its appearance before, during, and after labor, and recur in several successive pregnancies. If the eyes be examined with the ophthalmoscope, the retina will sometimes appear to be healthy, whilst at others a fatty alteration will be observed or an effusion of blood; regard will be had to the latter in the formation of a prognosis.

2. *Deafness.*—Puerperal deafness is less frequent than amaurosis, and like it is connected with albuminuria and caused by uræmia. The deafness is generally imperfect and almost always preceded by roaring in the ears. Like amaurosis, it may be intermittent, permanent, periodical, single or bilateral; may change into exaltation of the sense of hearing, be connected with other symptoms of albuminuria, or exist alone, although it accompanies amaurosis as it were by preference. We shall learn hereafter (see *Eclampsia*) that buzzing in the ears and deafness often precede and announce an attack of eclampsia (Imbert-Gourbeyre).

3. *Facial Paralysis.*—In connection with amaurosis and deafness may be placed paralysis of the third and seventh pairs of nerves—although it is much less frequent.

4. *Hemiplegia.*—Hemiplegia during pregnancy is of common occurrence, and M. Imbert-Gourbeyre has reported a large number of cases in his memoir. Sometimes it is caused by cerebral apoplexy; at others, no lesion of the nervous centres is discoverable at the autopsy, whilst the numerous examples of rapid and permanent recovery seem to prove that there could have been no grave lesion of the brain or spinal marrow. Albuminuria alone and often eclampsia have been observed with hemiplegia, so that Imbert-Gourbeyre feels no hesitation in saying that uræmia is the usual cause of this form of paralysis. As has been said, we do not partake wholly of this view (see *Uræmia*).

Hemiplegia may sometimes also be caused by anæmia, as shown by the following case: A young lady had, during the early months of her pregnancy, an imperfect hemiplegia characterized only by weakness and numbness. The symptoms were of short duration and recovery rapid and complete. In the absence of any other appreciable cause, the affection seemed to be due to a well-marked chlorotic condition.

Paralyses are not rare in hysterical women. There is nothing to prove that pregnant females enjoy any immunity in this respect, so that should any of the symptoms peculiar to hysteria exhibit themselves, it would be reasonable to attribute the paralysis to the pre-existing neurosis. In some patients even, the hysteria may appear for the first time during pregnancy and be attended by various

paralyses. It ought, however, to be noted that hemiplegia is rarely dependent upon hysteria.

Finally, when no cause can be discovered, we say, in order to conceal our ignorance, that the paralysis is essential.

5. *Paraplegia.*—Beside the usual causes of paraplegia, and independently of all those above noted, this paralysis may be occasioned by pressure of the fœtal head upon the nerves of the pelvic cavity or by reflex action. Paraplegia from pressure upon the nerves by the head ought to be rare during pregnancy; it has been more commonly witnessed during labor and after delivery, especially when the labor has been severe or attended with hemorrhage; we have nothing further to say in regard to this cause.

It is acknowledged, as stated, that paraplegia may be caused by reflex action; but how, in these cases, can its production be explained? How can a partial excitement of the uterus so react upon the spinal marrow as to suspend its functions? Without pausing before the various theories proposed by modern physiologists, we would say that, according to M. Jaccoud, who wrote a remarkable work upon the subject, paralysis is occasioned by exhaustion of the nervous system, and that numerous experiments upon animals tend, at least, to prove the correctness of his view: "A long-continued, abnormal excitement is transmitted to the spinal cord by the uterine nerves: after a longer or shorter time it exhausts the excitability peculiar to the corresponding region of the organ, and the inertia of these nervous elements under the action of the brain closes the avenues by which the motor impulse is transmitted; as a necessary consequence of this state of things there results paralysis of all parts situated below the affected points."

The following case of Echeverria's, which the author and others after his example have given as a type of the so-called reflex paraplegia is, to my mind, an absolute demonstration of the theory just stated—allowing the finger to be laid, as it were, upon the pathological mechanism of the paralytic affection. A woman who had miscarried three times continued to suffer after the last one severe pain in the hypogastrium, accompanied by a slight metrorrhagia. Seventeen days after the abortion the uterus was found to be anteverted; it was soft and voluminous, rising an inch above the pubis; the neck was sensitive, bled easily, and admitted the finger; the anterior lip was covered by a painful ulcer of a violet-red color.

Having determined these facts, Echeverria, with the double object of exciting the contraction of the uterus and hastening the cicatrization of the ulcer, had recourse to electricity by placing one pole of the apparatus upon the pubis, the other in the orifice of the cervix, and then transmitting a current of low power. Instantly violent pain was experienced in the womb, loins, and lower extremities, which were seized with convulsive tremors. The current was immediately suspended, when it was found that in place of the convulsion there was complete paraplegia, which lasted for fourteen hours (Jaccoud.) Is it not evident that we have here a case in which extreme excitement exhausted the irritability of the spinal cord? Loss of motion resulting and continuing until the functions of the nervous centre had been restored by adequate repose.

The causes of paraplegia may be various and combined, of which the following case is an example. A young primiparous lady, of extremely lymphatic temperament and affected with general œdema, had a tedious labor requiring the use of the forceps. Extensive laceration of the perineum occurred, and profuse hemorrhage attended the delivery of the placenta. The lying-in was also complicated by a double phlegmasia alba dolens, pleuritic effusion, and ascites. I attended this patient with my friend Dr. Siredey, now hospital physician, and we assured ourselves at various times that the urine contained no albumen. When convalescence was established, it was found on getting the patient up that she had paraplegia. For several months she was unable to stand, but the power of motion gradually returned until at length walking was possible with the assistance of a cane. Whilst this improvement was in progress the paraplegia suddenly became complete, the aggravation being afterward found to have coincided with the time of her becoming again pregnant; and throughout the gestation no improvement took place. During labor the limbs were thrown wildly about in a way which the patient would have been incapable of doing by any exertion of her will. After delivery the power of motion was again wanting. The paraplegia continued for several months without much amelioration, but finally disappeared under the use of strychnine and electricity, the recovery having been now for a long time perfect. In this case, thus briefly related, it would be reasonable to refer the beginning of the paralysis either to pressure by the head of the child during the first labor or to the hemorrhage attending the delivery of the placenta; but how shall we explain the recurrence of the affection during the next pregnancy? In my opinion, the cause of the new phase of the disease must be regarded as an instance of reflex action.]

§ 5. Intellectual Disorders. Insanity.

Those physicians who may be willing to admit the truth of the analogy which we have endeavored to establish between the sympathetic disorders of pregnancy, and those observed in young girls suffering from difficult or irregular menstruation (p. 61), will readily understand the functional aberrations of the intellectual and sensorial faculties so often observed in pregnant women.

The pre-existing alterations of certain organs of the senses are sometimes very happily modified by the occurrence of pregnancy. A young woman, whose imperfect vision had obliged her to use spectacles from childhood, found her sight so much improved immediately after the beginning of pregnancy as no longer to have need of glasses. (Obs. de Salmat, Cent. III. Obs. 27.)

At other times there is greater or less disturbance of the affective and intellectual faculties. I knew a young lady pregnant for the first time, whose former love for her husband was replaced by an antipathy which she was barely able to overcome. Another young woman, when five months gone, was suddenly seized with such an aversion for her apartment, that after many fruitless efforts, and notwithstanding all the force of her reason, she had to be left in the country for the remainder of her pregnancy.

Some exhibit a peculiar tendency to sadness, which is mentioned by Burns, and of which I have observed two cases. Certain individuals, who are usually of a gay disposition, suddenly become sad and morose; refuse all the enjoyments tendered to them, and entertain the belief that they will not survive their labor, with a tenacity that nothing can overcome. A young American lady, recommended to my care by M. Rayer, exhibited a profound melancholy for the last six weeks of her pregnancy. Although surrounded by her family, she declined all the pleasures of the capital. She wept unceasingly over her inevitable end, which was so near at hand, and was constantly expressing her distress at being obliged to leave all whom she loved. She had a happy labor, and from the next day her usual gayety was resumed.

[Disorders of intelligence may proceed even to insanity; although this form is more common with newly-delivered females than with pregnant women. Marcé's excellent book, which shall be our guide in the preparation of this article, gives as the result of several collections of statistics, that of 310 cases of puerperal insanity 27 came on during pregnancy, 180 after delivery, and 103 during lactation.

Puerperal insanity may date from the time of conception, or may appear during the course of gestation. In 19 of Marcé's cases it commenced with conception eight times, and in the remaining eleven during pregnancy. It began three times in the third month, once in the fourth month, three times in the sixth month, twice in the seventh month, and twice at times which could not be clearly ascertained. Melancholy seems to be the most common form of this insanity. Analysis of the above-mentioned 19 cases shows that the duration of the disease is very variable. Seven times the recovery dated from delivery; twice only did it occur during the course of gestation; nine times the disease continued, or else did not subside until long after delivery; finally, in one case, the delirium was exasperated by delivery, and death occurred shortly after. The physician ought, therefore, to be very guarded in his statements when questioned in regard to the probable result. It

is well also to know that when a woman becomes insane during gestation, there is reason to fear a recurrence should she again become pregnant.

Montgomery mentions the case of a woman who became insane at the commencement of three successive pregnancies. In another case, the derangement recurred in eight pregnancies, and ceased only after delivery. By a curious anomaly, however, it happens that some women suffer from this affection in one of their pregnancies only.

Hitherto we have studied the influence of pregnancy as productive of mental alienation; but there remains another question, the discussion of which will not be devoid of interest, to wit: What are the effects of pregnancy occurring in a woman who is already insane? In regard to this, Esquirol says, "Pregnancy, labor, and lactation are sometimes used by nature as a means of curing insanity, though, in my opinion, this result is rare." Almost always, indeed, pregnancy gives to mental alienation a character of extreme gravity, either as regards its form or its duration. It is evident, therefore, that the practice of some physicians who recommend pregnancy for insane women cannot be too strongly censured.

Labor itself, in its last stages, especially when the pains are extremely severe, may occasion disorder of the intellectual faculties. All accoucheurs, indeed, have described the excitement of mind which occurs under these circumstances, and which in some rare cases assumes the form of maniacal delirium. A woman in the hospital of the Clinique was suddenly, when near the termination of her labor, afflicted with a complete hallucination; she saw a spectre at the foot of her bed endeavoring to injure her, and which she made strong efforts to drive away. The illusion lasted hardly two minutes before her mind became perfectly sane. The transitory insanity occurring thus during labor is doubtless caused by the excessive pain. Notwithstanding its apparent gravity, it is rarely followed by serious consequences if care be taken, by sufficient watchfulness, to prevent the lamentable acts to which the patients might be impelled. It subsides spontaneously, and very rarely passes into long-continued mania.

The part of the physician, in these cases, is easily pointed out. Generally everything will be left to nature; but should the labor last too long, delivery should be effected by the forceps. Bloodletting at a later period, should it be indicated by the signs of plethora, antispasmodics and judicious expectant conduct will suffice for the successful management of an occurrence which in itself presents but little gravity.

There remain a few observations to be made upon the subject of the insanity of lying-in women and nurses, known as *puerperal insanity*. As predisposing causes of this affection may be mentioned inheritance, numerous pregnancies, advanced age of the subjects, previous attacks of insanity, eclampsia, and the return of menstruation. Sometimes the disease commences suddenly, but is often preceded by an accelerated pulse, heat of skin, dryness of tongue, thirst, and the entire assemblage of pyretic symptoms.

The various forms of mental alienation are far from occurring with equal frequency under these circumstances, but may be represented in the following order: first, mania; secondly, melancholia and partial insanity.

The mania of lying-in women ends in recovery, incurability, and, in some rare instances, death. Of these, recovery is by far the most frequent termination, and may be said to include about two-thirds of the entire number of cases. Cases are mentioned in which the affection subsided in less than three days, though it more commonly terminates within the first month following the commencement of the attack. Again, recovery may be postponed as late as the sixth month, or not take place until after one, two, or more years. The prognosis is most favorable in melancholia and monomania.

A great variety of remedies have been recommended in the treatment of puerperal mania. Warm baths, purgatives, and narcotics are the most available at the outset. It is of the greatest importance to watch the patients, and not lose sight of them for a moment. The children should be taken away (Marcé).]

ARTICLE VI.

DISEASES OF THE SKIN.

§ 1. Itching.

The skin during pregnancy is sometimes affected with extreme itching without any appreciable lesion. M. Maslieurat-Lagemart has published a remarkable case of a lady who, in eight successive pregnancies, was afflicted with itchings so violent as to produce premature labors. On four occasions, they began in the sixth month; twice at eight months and a half, and twice in the seventh month. They appeared almost instantly over the entire cutaneous surface; the legs, thighs, genital parts, the whole trunk, the neck, face, scalp, were all affected; nothing escaped but the palms of the hands, and even they were invaded at a later period. So severe were they, that the violent rubbings of the poor sufferer excoriated the skin. Hardly was she delivered when they vanished entirely. The skin retained its natural transparency, color, and brightness throughout. Simple and alkaline baths, ammoniacal and camphorated frictions to the spine, preparations of opium, bismuth, valerian, hyoscyamus, belladonna, and bleeding, were all employed without advantage.

Three cases of general itching which I have had occasion to treat yielded quite promptly to alkaline baths. (Five ounces of carbonate of potash to an entire bath.)

[§ 2. Pigmentary Spots. Pityriasis.

The skin during pregnancy often becomes affected with yellowish spots known as ephelidæ, *chloasma*, and *pityriasis versicolor*. When they appear on the forehead, cheeks and chin, they receive the common name of *mask*. These spots affect by preference the face, especially the forehead; they vary in size, are almost symmetrical in form, and never extend to the roots of the hair, from which they always are separated by a border of healthy skin. It would seem that the action of light is one of the principal conditions of their formation, and that the shadow of the hair is sufficient to arrest their progress.

M. Hardy, physician of the Hospital St. Louis, classifies them as ephelides and pityriasis.

The *ephelides* make no projection from the surface, and are attended by neither itching nor desquamation; their examination would almost lead one to say that the pigmentary matter had left the healthy parts and collected in the spots, on account of the apparent bleaching of the skin around them. They are the result, simply, of an accumulation of pigment within a circumscribed space. Ephelides often appear in women at the menstrual period, and more especially during pregnancy: they usually vanish after delivery, though, much to the chagrin of those affected, this does not always happen. When they continue, a special treatment, having for its object the production of a superficial inflammation of the skin, will often prove successful. To effect this, M. Hardy recommends frictions to be made twice a day with the following lotion:

℞.—Water	f℥ iv.
Corros. Sublim.	gr. v.
Sulph. Zinc	ʒss.
Acetate of Lead	ʒss.
Alcohol	*q. s.*

to dissolve the corrosive sublimate.

Should the lotion fail, sulphurous douches, especially with the mineral waters of Luchon and Baréges, applied to the affected parts, may be used with advantage.

Pityriasis versicolor, also termed hepatic spots and chloasma of pregnant women, appear in the form of spots bearing strong resemblance to the ephelides. In pityriasis, however, the spots project slightly from the surface of the skin, and the epidermis becomes detached in the form of little scales, either spontaneously or

by scratching. They are always accompanied by itching, which is generally slight. The characters just mentioned will suffice to distinguish *pityriasis versicolor* from ephelides, in which there are neither elevation, desquamation, nor itching. Pityriasis versicolor is a parasitic disease, so that the microscope affords another means of diagnosis by exhibiting the spores and numerous ramifications amidst the epithelial scales.

The pityriasis of pregnancy usually declines after delivery, though in some cases it remains and offers great resistance to the treatment employed.

The therapeutic measures are very simple. Sulphurous waters, by lotion or douche, and ointments containing sulphur, are often effectual. The foregoing lotion (see formula) and nitric acid ointment produce similar results.]

ARTICLE VII.

LESIONS OF THE PELVIC ARTICULATIONS.

§ 1. Relaxation of the Pelvic Articulations.

The question has long been agitated whether the ligaments which unite the bones of the pelvis are ever softened, and whether the articulations are movable. Ambrose Paré himself, that great surgical luminary, did not adopt the opinion of Hippocrates until after Saverin Pineau made a dissection, in 1569, of a woman recently delivered, in his presence. But, at the present day, this question is determined by a very great number of cases, and it is now generally admitted that a ramollissement of the symphyses actually occurs in most females during gestation.

This softening may be and generally is slight; though it may be carried to so great an extent as to admit of considerable separation between the articular surfaces, constituting then a true pathological alteration. Hunter, Morgagni, and some others, cite instances where the relaxation was such that the pubes could be drawn more than an inch apart.

With our present knowledge on the subject, it is impossible to explain the cause of this softening; for, when trifling, it generally escapes the notice both of the woman and her physician; but, if well marked, a separation of the bones takes place as just stated.

Authors do not agree as to the manner in which the separation is produced; since, according to some, the cartilages are softened and thickened by the liquids that penetrate them, acting like a piece of prepared sponge placed between two bones to absorb the effused fluids; whilst others imagine them to resemble the roots of the ivy, which insinuate themselves into the little crevices between the stones of a wall, and finally overturn it. Louis thinks they act more like dry and porous wooden wedges placed in the fissures of a rock, which, by imbibing moisture, swell up and ultimately split the rock,—or like polypi in the nasal fossæ and frontal or maxillary sinuses.

M. Lenoir supposes that a slight degree of this relaxation is due simply to serous infiltration of the pelvic ligaments resulting from the pregnant condition; the articular surfaces are, therefore, not separated, though separation is possible under the influence of actions tending to produce it. In the more advanced stages, he adds to this softening a hypersecretion of synovia, which distends the articular cavities, and separates the bones that constitute them. Mobility in these cases is great, and if the joints be opened in the dead body, a viscid fluid is discharged abundantly, as was once observed by Morgagni.

This relaxation may, according to Baudelocque, oppose the spontaneous termination of the labor, by destroying the *point d'appui* which the abdominal muscles derive from the bones of the pelvis; and perhaps, also, the distress produced by the engagement of the head, forces the woman to restrain the pains as much as possible; though, on the other hand, from the observations of Desormeaux, Smellie, etc., we learn that this circumstance, so far from being a cause of dystocia, has actually permitted a spontaneous delivery in some cases where the disproportion between the size of the head and the dimensions of the pelvis would have otherwise rendered it impossible.

[The attention of physicians has, of late years, been again called to the study of the relaxation of the pelvic symphyses by a work of M. Ferdinand Martin, which was soon followed by M. Danyau's report. A special article was devoted to the subject in the previous editions of this work, so that M. Trousseau was wrong in supposing that it had been omitted. (*Leçons Cliniques sur le Relâchement des Symphyses du Bassin*, May, 1865.) Nevertheless, as the affection is still badly understood, frequent errors in diagnosis are the consequence.

The pains in the back which many pregnant women suffer are due simply to relaxation of the symphyses. To be convinced of the fact it will be sufficient to examine the lumbar region by pressure over the sacro-iliac articulations, when, if they be diseased, decided pain will follow. The same remark applies to the symphysis pubis, which is often the seat of the vague pains complained of in the lower part of the abdomen.

In all these cases it is the more easy to be deceived, as the patients, on being questioned, are rarely able to define clearly the seat of their suffering, and the real affection is overlooked if care be not taken to make a direct examination. How often is the uterus regarded as the source of the pain, when the lesion is precisely located in the pelvic articulations!

The spontaneous pains produced by relaxation of the pelvic symphyses are more particularly awakened by motion of the lower extremities, as in walking and standing, and usually subside upon lying down. In slight cases walking is difficult, the patients are soon fatigued, drag their limbs, and are unable to stand upon one foot. In a more advanced stage, walking becomes increasingly difficult, painful, and finally impossible. When the patient would stand, the sensation is as though the sacrum descended between the iliac bones, or as though the body would drop between the thighs. It is then quite possible by moving the lower extremities to perceive the motion of the ilia, and sometimes even a very sensible crackling or clicking can be detected. In one of M. Trousseau's patients the end of the forefinger could be readily inserted between the two pubic bones and a softened condition of the interarticular cartilage perfectly detected.

Relaxation of the pelvic symphyses is often greater after delivery than during gestation, and, though more evident during the lying-in, is still often overlooked, and the pains which it occasions attributed to metritis or uterine displacement. In all these cases, however, the symptoms are the same and require similar treatment.

The prognosis is variable; in slight cases no treatment is required and the affection disappears after delivery. In a more advanced stage, rest in bed is insufficient, and an appropriate treatment becomes necessary. Sometimes three, six, or eight months, or several years, are required for the consolidation to take place. In one of M. Martin's patients the cure was postponed until after another labor. There are facts, indeed, which go to prove that relaxation of the symphyses may continue through life in spite of the best treatment. Finally, in the following article we shall speak of inflammation and suppuration of the symphyses, which may also occur and lend fresh gravity to the affection.

As soon as the relaxation is discovered, the patient should be put to bed and kept strictly at rest, with the pelvis held motionless by means of a compressory bandage. For this purpose a towel passed around the pelvis and drawn very tight may answer in the simplest cases. The procedure is at once a rational treatment and a means of diagnosis, inasmuch as relief is generally immediate, and, if successful, leaves no doubt as to the nature of the disease. Bandages of linen or ticking are, however, liable to stretch and loosen in a very short time, in which case a good substitute is found, according to Boyer, in a leather belt quilted internally and caused to surround the pelvis between the great trochanter and crest of the ilium and buckled in front. The best apparatus, however, is the one recommended and used by M. Martin. It is composed of a

strong circular piece of metal two inches wide, open in front, and large enough to embrace the entire circumference of the pelvis. It is padded and quilted like the spring of a truss, and provided at one end with a strong strap and with a buckle at the other, whereby the ends are brought together and held firmly. This apparatus has the advantage of being applicable during pregnancy without interfering with the development of the abdomen, and is even more useful after delivery. Although its weight is considerable, the patients soon become accustomed to its use. It secures immobility of the bones so fully that absolute quietness is no longer necessary, and the patients may walk every day without the recovery being interfered with.

"We owe," says M. Danyau, "the acknowledgment to M. Martin, that his belt fulfils all the indications, and that none other does so more effectually. Not only is it, like Boyer's, narrow enough to clasp the pelvis where the pressure can produce neither interference nor injury and be at the same time really effective, that is to say, between the crests of the ilia and the great trochanters, but, what is not less important, it is so strong and stiff that when once applied and the bones brought in contact by it, separation afterward becomes impossible."]

When, to relaxation of the pelvic articulations, inflammatory symptoms are added, they should be met by the appropriate means; in their absence, we may apply gentle pressure around the pelvis, and make use of some topical applications, general and local tonics, and astringent and resolvent lotions. After the total disappearance of the lochia, Desormeaux highly extols the employment of douches, sea-bathing, a good diet of nutritive articles, the Spa and Seltzer waters, wearing flannel next to the skin, and dry frictions. We cannot recommend too highly the use, in these cases, of the steel girdle of M. Martin, which, when tightly drawn around the pelvis, immediately restores a portion of its normal solidity, and facilitates the cure wonderfully.

These measures should be continued for a long time, and even when convalescence is fully established, the greatest possible care must be exercised in rising, walking, etc.

§ 2. Inflammation of the Pelvic Articulations.

Inflammation of the pelvic articulations, which is sometimes observed after labor, may also occur, though more rarely, during pregnancy. Drs. Hiller, Monod, Danyau, and Professor Hayn, of Königsberg, have mentioned instances of it.

The disease generally begins without appreciable cause, with sudden, acute, sometimes lancinating, though usually heavy pain, in one or several of the pelvic articulations. The pain is increased by pressure, standing, and especially by attempts at walking, which is sometimes altogether impossible.

These pains often extend into the lower extremities, and especially into the thighs. Swelling can sometimes be detected over the inflamed articulations.

These articular pains are sometimes attended by a febrile movement, which is occasionally severe, though generally quite moderate. In some cases, indeed, there is almost no general reaction.

The inflammation, when moderate, usually yields promptly to proper treatment; the cure is almost perfect after twelve or fifteen days, and the delivery and lying-in seem to experience no unfavorable effect from it. In some cases, however, whether in consequence of the intensity of the inflammation, or because the proper means were not employed with sufficient energy, the disease ended in suppuration, and in two instances proved fatal. In these cases, the articular surfaces were found denuded of cartilage. MM. Hiller and Monod mention two cases which proved fatal in this manner.

If the pains are very acute, and the general reaction decided, general and local bleeding may be employed at the outset. But when there is no fever, and the local symptoms are moderate, we may be content with resolvent applications, restricted diet, and absolute repose in the horizontal posture. Narcotics may be added to the resolvent applications, if the pains are too severe.

ARTICLE VIII.

DISEASES OF THE VULVA AND VAGINA.

§ 1. Pruritus of the Vulva.

Pruritus of the vulva, though not peculiar to, often occurs during pregnancy. It is characterized by intense itching of the external genital parts, the labia majora and minora, and often extends even into the vagina. The itching is irresistible, obliging the patients to scratch themselves, and thus, in consequence of the relief afforded, leads to a sort of masturbation.

Examination of the affected parts discovers no appreciable alteration: sometimes there is redness, at others some exudation of serum with superficial ulcerations reminding one of eczema. (Hardy.)]

The itching was so insupportable in a young married lady under my care that she could not refrain from continual scratching, and the general irritation resulting therefrom almost threw her into convulsions.

In another instance, a young girl, who wished to conceal her pregnancy, was so tormented by this disease, that it was absolutely impossible to hide her distress from the observation of her family; and when I examined her, I found the internal face of the labia externa, and the nymphæ, both swollen and inflamed from the constant scratching; the nympha on the right side had been so long, and so strongly dragged upon, that it had acquired twice the usual length at least. Generally speaking, the frequent use of bathing, and of the vegeto-mineral lotions applied five or six times a day, will calm the itching; and as it is often greatly aggravated by walking, perfect rest is of course indicated. Some advantage is often to be derived from a fine compress dipped in oil of sweet almonds, and then placed in the vulvar fissure; or still better, if the compress be soaked in lead-water.

Dewees states that he examined a young lady who complained of this excessive itching in the genital parts, and he found the internal face of the vulva, as also the inferior part of the vagina, covered by numerous aphthæ; and that the application of a strong solution of borax, four or five times a day, caused them all to disappear in the course of twenty-four hours.

Dr. Meigs has always found the following preparation useful:

℞—Borax	. . . . .	ʒij.
Sulph. of morphia	. . . . .	gr. ivss.
Dist. rose water	. . . . .	fʒviii.

Apply three times a day to the affected parts, by means of a sponge or piece of linen, taking care to wash the parts beforehand with soap and water, and to dry them well afterwards. The following solution of bichloride of mercury may also be used with advantage: Add a drachm and a half of corrosive sublimate to four ounces of distilled water, and of this solution let the patient add a dessert-spoonful to a pint of *very warm* water, and use for injections and lotions. Hot water alone will answer in many cases. (Trousseau and Pidoux.)

[Pruritus of the vulva is often very obstinate. In the rebellious cases mentioned, M. Dubois advises that the entire mucous surface of the vulva be cauterized with the solid nitrate of silver. A great objection to it however is, that it is extremely painful and almost always produces but temporary alleviation. We have generally succeeded with a solution of corrosive sublimate, as follows:

℞—Bichloride of mercury	. . . .	gr. xxxi.
Alcohol	. . . . .	fʒiij.
Rose water	. . . . .	fʒiss.
Distilled water	. . . . .	fʒxv.

This is used as a wash, undiluted, morning and evening, as follows: After using warm water for the purpose of removing mucous secretions from the vulva, and drying the parts well with a piece

of fine linen, a small sponge saturated with the fluid is passed rapidly over the entire itching surface, so as to moisten it thoroughly. A smart burning sensation is the first effect of the application, which is alleviated by a few minutes' washing with cold water. Subsequent applications are less and less painful, and the cure is generally rapid. We prefer this treatment to all others.]

[We have had great satisfaction in the treatment of these very distressing cases from an application of carbolic acid and olive oil. Direct the woman to put into the vagina at bed-time a pledget of cotton saturated with a mixture of carbolic acid and olive oil, one part of the former to thirty of the latter. A string should be attached to the cotton to enable her to withdraw it in the morning.—G.]

§ 2. Leucorrhœa.

We shall limit ourselves to a short notice of the profuse leucorrhœa with which women are very often affected during pregnancy. This discharge, which is sometimes white and sometimes of a yellowish-green color, usually makes its appearance during the second half of gestation, though I have seen some persons affected with it from the early months. It is generally coincident with the development of numerous granulations, which, as we have already said, sometimes cover the vaginal mucous membrane, and constitute what has been described of late as *granular vaginitis*. When it is very profuse, an examination by the speculum frequently discovers numerous ulcerations of the neck of the uterus. We shall have occasion to speak of these ulcerations hereafter. I am convinced that the vaginal granulations and ulcerations of the cervix are very rarely as serious during gestation as they appear to be under some other circumstances, since they generally disappear with the pregnancy, during which they are developed.

Sometimes the discharge is so abundant as to react upon the functions of the stomach, and I have seen several patients with symptoms of gastralgia, evidently connected with the leucorrhœa, inasmuch as they increased or diminished according as the latter was more or less profuse.

This affection often produces, in addition, great irritation, a burning heat, and sometimes an almost insupportable itching of the lower part of the vagina and external genitals. A profusion of small vesicles appear upon the internal surface of the greater and lesser labia, which, by constantly rubbing against each other, finally give rise to excoriation, and render walking very painful.

Frequent baths, lotions, and injections of cold water, to each quart of which a dessert-spoonful of subacetate of lead has been added, repeated several times daily, according to the degree of pain, are the best remedies. It will also be found advantageous to separate the parts, by introducing a piece of fine linen between the labia, so as to prevent friction whilst walking. It is unnecessary to say that the introduction of the speculum during pregnancy requires that especial care be taken not to press it too far.

Though the patient's sufferings may easily be alleviated in this manner, it is more than probable that the granulations will continue, and that the discharge will not cease entirely; in spite of all that can be done, it generally lasts until the end of pregnancy, and in the great majority of cases only terminates after delivery.

[Would any disadvantage attend the insertion in the vagina of tampons formed of carded cotton and alum? Would they be likely to occasion abortion or premature delivery? During my present temporary service at the Lourcine hospital, I have found quite a number of pregnant women affected with vaginitis and profuse leucorrhœa, and in all such cases it is the practice there to use the above-named tampons, notwithstanding the fact of pregnancy. I continue them as they have been used heretofore, though not without apprehension; still no accident has occurred as yet. I should desire, however, a longer experience, before I could feel willing to advise them.

Vaginal injections, especially if used indiscreetly, may excite contraction of the uterus and abortion, if the fluid be thrown upon the os tincæ.

§ 3. Vegetations.

The external parts of generation, particularly in women affected with blennorrhœa, vaginitis, or uterine catarrh, often become covered with vegetations, which were long supposed to be of a syphilitic character. They seem always to be connected with the presence of a discharge in non-pregnant females; that their production may also be favored by pregnancy is a fact established, as I think, by the treatise of M. Thibierge.

The vegetations may appear in pregnant women at any period of gestation. They consist of tufts of a rosy hue, attached by a pedicle, and spreading out like a cauliflower. In respect to number and size they vary greatly.

They may be either scattered or so grouped as to form large masses. A patient in the Hospital of the Clinic had them in the form of a tumor as large as the fist. They affect more especially the mucous membrane of the vulva, though they also form on the external surface of the labia majora, in the furrow between the buttocks, about the region of the anus and the genito-crural folds: sometimes, even, they sprout from the walls of the vagina or the os tincæ, though in these situations they are generally small.

They are attended with itching, considerable pain, and a discharge. They also exhale a very unpleasant odor, but are really devoid of danger, and occasion no obstruction to delivery, even when of large size. In the majority of cases they disappear spontaneously after delivery; the pedicle dries up, and they fall like a ripe fruit. This favorable termination is not, however, universal.

One of their peculiarities is that of continuing to sprout during gestation in spite of all kinds of treatment. Still, M. Thibierge thinks that the use of local applications during pregnancy may dissipate them when small and few in number. Under other circumstances they are almost certain to return.

In regard to treatment during pregnancy, an attempt may, in the first place, be made to destroy them by local applications, as of alum, nitric acid, or the acid nitrate of mercury applied drop by drop. Excision, and even crushing, are liable to occasion obstinate hemorrhage, so that radical operations ought not to be performed. After delivery, should the trouble persist, any of the methods of treatment used in such cases become applicable.]

ARTICLE IX.

ABDOMINAL AND UTERINE PAINS.

Beside the numerous functional disorders just studied, some pregnant women suffer, in various parts of the body, pains whose intimate cause is imperfectly understood, and to which they sometimes call the attention of the physician. Some of these pains appear to be seated in the abdominal parietes, the lumbar region, the groins, and the internal part of the thighs; others, again, appear to affect more especially the walls of the uterus, or the annexes of that organ.

§ 1. Abdominal, Lumbar, and Inguinal Pains.

These pains, which are sometimes confined to a quite limited space of the abdominal parietes, do not often appear before the latter months of gestation. They are frequently felt at the lower part of the breast, near the upper insertions of the abdominal muscles, or, less often, in the inguinal folds near their inferior attachments. The pains are much increased by motion, the least pressure, and sometimes, also, by the movements of the child, if violent. As already stated, they are generally limited in extent, sometimes not affecting a space larger than a silver dollar, the parts surrounding being entirely free from pain.

Since lumbar and inguinal pains, occurring in the first half of gestation, may be the preludes of an abortion near at hand, they claim special attention. At this early period they are almost uniformly the sympathetic expression of uterine disorder, itself due to a local congestion, though perhaps still oftener to a special irritability of the womb. They then resemble precisely the lumbar and inguinal pains which are so often experienced by

young girls affected with dysmenorrhœa or amenorrhœa, and are effectually overcome by opiates, small revulsive bleedings, and sometimes also, in very nervous women, by warm bathing. If, as is often the case, the pains seem to be increased by sexual intercourse, too long a walk, or riding in a carriage, it were useless to say that abstinence from all these causes, and repose in the horizontal posture, are the first indications to be fulfilled.

These pains most commonly appear toward the end of pregnancy, but their cause, that especially of the lumbar pains, is very obscure. Sometimes, however, it can be ascertained that they are seated in the pelvic articulations (see page 83). Dragging upon the broad ligaments, compression of the lumbar nerves, extreme distension of the uterus, and engorgement of the pelvic and uterine vessels, have been successively adduced in explanation; but though the relief obtained from bleeding, in some cases, would seem to show that they might sometimes be caused by local plethora, there is no evidence of any such influence as is attributed to the other causes mentioned.

The inguinal pains have generally been referred to traction upon the round ligaments. I do not say that this traction may not produce them, but I am convinced that toward the end of pregnancy they are oftener due to the pressure of the uterus upon that region, in the vertical as well as in the sitting posture. They generally disappear, indeed, in the horizontal position, and the best means of relieving the patients is to support the abdomen, and at the same time raise it a little by means of a well-made corset, or of a large abdominal belt, the central portion of which embraces the sub-umbilical region, and whose two ends are attached to the back part of the corset.

[Having for some time made a special study of these abdominal, inguinal, and lumbar pains, we are convinced that very often they are due to neuralgia of the cutaneous nerves from the collateral branches of the lumbar plexus. To be assured that such is the case, it is only necessary to test carefully the sensibility of the skin in these regions, either by rubbing it rudely with the end of a pencil, or by raising it in the form of a fold which is to be gradually pinched between the fingers. Pressure ought also to be made all along the crest of the ilium in the direction of the genito-crural nerve. Should we be satisfied with merely questioning the patients, or depressing the walls of the abdomen by the hand, we would incur the risk of obtaining very little information, or of suspecting the existence of a deep-seated visceral pain when the skin only is affected. This mistake, which we see committed every day, would be avoided by taking the trouble to make the above-mentioned examination, and we cannot recommend it too highly.

The principal parts affected by this neuralgia are the lumbar, iliac, hypogastric, and inguinal points, though the pain may appear in some other portion of greater or less extent of the skin of the abdomen. Sometimes confined to a circumscribed point, it occasionally invades an entire half of the abdominal walls. It very rarely affects both sides at the same time with equal intensity.

The local application of narcotics constitutes the treatment *par excellence*, of these neuralgic pains. We have almost always succeeded with very small blisters sprinkled with one of the salts of morphia. Subcutaneous injections are also clearly indicated, and none of these methods are liable to affect unfavorably the course of the pregnancy.

What we have just written applies especially to the abdominal neuralgia of pregnant women; but before leaving the subject, we desire to say that the same affection is also extremely common after delivery. In the latter case, however, instead of being the chief pathological element, it is almost always symptomatic of a lesion of some one of the pelvic organs. Its investigation is not, on this account, less important, because, generally, the intensity of an inflammation is estimated by the acuteness of the pain which it produces. Under these circumstances, if the skin be raised carefully between two fingers, and the fold thus formed be pinched, it is often found that the pain is seated partly in the skin and not in the uterus or its appendages. The physician is thus better informed, since a slight metro-ovaritis may be attended by a violent cutaneous neuralgia more alarming by far than dangerous.

The lumbo-abdominal neuralgia which is symptomatic of a metro-ovaritis or of a metro-peritonitis, also enables us to understand certain facts which would be inexplicable without it. Suppose a newly delivered female to be attacked by metritis; the uterus is examined by depressing the walls of the abdomen by the hand, and several examinations carefully conducted assure us that pain is produced about the fundus of the organ. The usual treatment in such a case consists in the application of leeches directly over the seat of pain, and, we must say, almost always affords relief. Is it not surprising that such a result should be produced? How could we suppose that an abstraction of blood from the skin of the abdomen near the umbilicus would act directly upon the fundus of the uterus when all vascular communication between the two parts is prevented by the interposition of the peritoneum? We bow before the facts, yet believe that the bites of the leeches, when they afford relief, do so by acting directly upon the cutaneous neuralgia which is symptomatic of the metritis, and have no effect upon the vascular engorgement of the uterus. The same result would follow the application of a blister dressed with a salt of morphia. As soon as time shall permit, we intend publishing several cases which go to prove what we have just said respecting the part played by lumbo-abdominal neuralgia during pregnancy and in the diseases of lying-in women.]

The pains in the internal parts of the thighs, the numbness and cramps of both legs, though more commonly of one only, are usually attributed to pressure of the head on the lumbar and sacral nerves. But, as Tyler Smith remarks, since they mostly occur at night, when the women are in the horizontal posture, or whilst they are sitting, in both which positions the pressure should be much less than whilst standing, it seems very probable that compression of the nerves is not the cause. Perhaps we may accept the idea of the English accoucheur, that, like the corresponding affections in cholera, they are connected with some irritation or difficulty of the large intestine, or with a morbid condition of the uterus. It would not be the only instance of visceral irritation producing spasmodic contraction of the muscles of animal life by reflex action.

According to this hypothesis, the best means of preventing the recurrence of the cramp is to keep the bowels free, and allay the irritability of the womb as much as possible by baths, opiates, etc. The surest means of counteracting it is to contract voluntarily, the very moment it appears, the antagonistic muscle of the affected one; thus the thigh should be strongly extended when the flexor muscles are contracted, and the foot should be flexed on the leg when the cramp affects the muscles of the calf.

§ 2. Uterine Pains.

1. Beside the uterine pains which sometimes accompany the outset of a disordered pregnancy, also beside those which seem to herald the approach of labor in the latter weeks of gestation, females experience, at variable periods and intervals, pains which are sometimes very acute, and evidently seated in the walls of the uterus itself. It is impossible to determine the cause and nature of these pains; for though they may be attributed, in some rare instances, to partial spasm of the muscles of the uterus, or to a more or less extensive inflammation, most frequently nothing of the kind is to be discovered. Sometimes they are limited to a single circumscribed point, whilst at others they affect the entire womb. In the first case they are continuous; in the second they are irregularly intermittent, and their recurrence, or rather their paroxysm, appears to coincide with a motion of the female, pressure upon the abdomen, an attack of coughing, or sudden movements of the child. At the same time the uterine tumor may almost always be felt to become denser and harder: in short, a true contraction takes place, which continues as long as the paroxysm lasts. If, struck with this condition of the body of the womb, an examination be made *per vaginam*, the cervix will be found unchanged, having undergone no alteration which could excite solicitude on account of

the long-continued previous contractions. Usually, there is very slight general reaction, and little or no fever.

When the pain is both circumscribed and moderate, emollient and narcotic applications may be found sufficient; but when more severe, it will be necessary to prescribe the most absolute repose, injections with camphor and laudanum, baths, maniluvia, and even bleeding from the arm. It generally yields to these measures when properly employed, though, unfortunately, it returns with some individuals very frequently. I have, at this moment, a young lady under care who is at the eighth month of her pregnancy, and who has had five attacks within three months, two of them lasting for twenty-four hours. The first time she was bled; but as her general condition seemed to contraindicate a repetition of this measure, and she was very averse to bathing, I was obliged to content myself with prescribing rest and opiate injections. Now, there is every prospect of her reaching her full term.

2. The sensibility of the uterus is sometimes singularly increased by constant and violent motions of the fœtus. Some children, indeed, seem endowed with such activity that they are hardly ever quiet, and their continual movement becomes a cause of irritation to the womb, which, by reacting upon the whole economy, may produce insomnia, general excitement, and nervous and sometimes even convulsive movements. I have seen two instances of these disordered motions of the child; especially was it marked in the case of the wife of one of my professional brethren. This poor lady was delivered at term, notwithstanding she had been almost entirely deprived of sleep during the eighth and ninth months. Burns says, that patients under these circumstances are delivered rather before the ninth month. The bleeding and opiates which he recommends may indeed lessen the irritability of the uterus, but evidently can have no power to diminish the activity of the motions of the child, which is the first cause of the uterine pains.*

3. Some authors state that metritis, or metro-peritonitis, are possible during pregnancy, but they are so rare that it has never fallen to my lot to see them. Besides, they seem to me to belong to the same category as all the acute affections which may arise during pregnancy; and though the usual gravity of the prognosis be heightened by the condition of the female, the treatment would be the same as after delivery.

§ 3. Rheumatism of the Uterus.

Rheumatism of the uterus, although studied for a long time in Germany, was scarcely known in France until M. Dezeimeris published in his journal (*l'Expérience*) a series of facts that were previously known to, and put forth by, the German authors. About the same time, M. Stoltz, who was acquainted with the works of our neighbors on the subject, devoted particular attention to this affection at the Clinical Hospital of Strasbourg, and communicated the result of his observations to his pupils. One of them, Dr. Salathé, has quite recently defended a thesis on this subject; and from his work, as also from the bibliographical researches of M. Dezeimeris, I extract the following account of this disease, which is unknown to French nosologists.

According to Radamel, rheumatism may attack the uterus in the non-gravid state; but we have only to study it here as occurring in pregnant females, in whom it may appear at all stages of the puerperal condition. Therefore, after some general remarks on the disease itself, it will be necessary to point out the influence that it may have over the gestation, the parturition, and the lying-in.

Causes.—Every circumstance calculated to favor the development of the rheumatic affections in general may likewise prove a source of rheumatism of the uterus: thus, a momentary or a prolonged exposure to cold and moisture, inadequate clothing, or sudden changes from a very high to a very low temperature, and all those other atmospheric conditions which have been enumerated by medical authors, either as predisposing or as determining causes of rheumatism, may likewise produce that of the womb. But, besides these general causes, there is one peculiar to the disease under consideration; that is, the susceptibility of this organ to the impression of cold under the attenuated integuments of the abdomen during the latter months of gestation; for the belly is only covered at that particular point by very light clothing, which is far from fitting closely, and the lumbo-sacral region is often but imperfectly protected by the short jackets worn by the patient.

Symptoms.—Rheumatism of the uterus very often occurs in persons who are constitutionally predisposed to the rheumatic affections; and it may co-exist with a general disorder of the same nature, though in the majority of cases the womb, together with its appendages and the adjacent parts, is alone affected. Again, it has oftentimes resulted from a sudden cessation of a rheumatic pain at some other point, which is speedily transferred to the uterus. But, whatever may have been the mode of its attack, this disease exhibits some well-marked peculiarities, by which it can easily be recognized. The principal symptom is pain, or a distressing sensation, which involves the whole, or a part of the womb, without any violence having been exerted on the organ; its intensity varies from a simple feeling of heaviness to the most painful dragging sensation; and it may occupy either the entire womb or only one of its parts, such as the body, the fundus, or the inferior segment. When the rheumatism is fixed in the fundus uteri, the pain is particularly apt to be felt in the sub-umbilical region; it is augmented by pressure, by the contraction of the abdominal muscles, and sometimes even by the simple weight of the bed-clothes; and in many cases the patient is unable to bear any movement whatever. If seated somewhat lower, she suffers from acute dragging sensations, that run from the loins toward the pelvis, the thighs, the external genital organs, and the sacral region, along the uterine ligaments. Finally, when the inferior segment participates in the affection, the seat of it can be detected by the vaginal exploration, which gives rise to the most acute sufferings. But, of all the causes that may exasperate these pains, there are none more distressing than the incessant movements of the child.

Like all rheumatic pains, those of the uterus are metastatic, and they occasionally pass rapidly from one point of the organ to another; often, indeed, they disappear at once and pass off to some other organ. This is particularly apt to occur when the pain was originally located at some other point, and measures have been employed to recall the affection to the part primitively attacked.

They present frequent and variable exacerbations in their duration and intensity, according to the stage of the disease; sometimes they are followed by remissions, during which the patient experiences only a vague sensation of weight in the part. The uterine pains are usually accompanied by a recto-vesical tenesmus, which is the more distressing as the former are the more energetic, and are seated near the inferior segment. The patient is then tormented by a continual desire to empty her bladder; the emission of urine is attended by a smarting sensation, and sometimes by acute sufferings, while at others it is even wholly impossible; and in many cases the attempts to move the bowels prove equally ineffectual. Most of the German authors attribute this double recto-vesical tenesmus to a rheumatic affection that is not always exclusively limited to the womb, but which also invades the neighboring organs. But M. Stoltz appears disposed to believe that it is rather the result of the close sympathy existing between these adjacent parts; for, if these new pains were occasioned by a rheumatism of the rectum or bladder, those of the uterus ought to disappear altogether, or at least should be diminished. (*Salathé's Thesis.*)

Analogy would lead us to suppose that an unusual heat and tumefaction must exist in the affected parts; but the difficulties in de-

* Dr. Tyler Smith endeavors to show, in a very interesting memoir, that the active motions of the child amount to almost nothing, and that the sensations perceived by the mother and accoucheur, hitherto attributed to the muscular contractions of the child, result simply from partial contraction of the muscular fibres of the uterus. Notwithstanding the seductive character of the reasons adduced by Dr. Smith, we hold to the generally received opinions, though entirely disposed to think that the views of the English accoucheur may be applicable to the exceptional cases of which we are speaking.

tecting these characters are self-evident, although their existence is quite probable.

Such acute pains, seated in so important an organ, would naturally produce considerable general reaction; and it is found that this disease, like the greater number of the inflammatory affections, most usually commences by a slight chill, which lasts for a quarter of an hour or twenty minutes; the fever that follows it diminishes, and sometimes disappears altogether, during the interval between the paroxysms; but, pending their duration, it is usually quite intense, the pulse is frequent and hard, the face excited and flushed, and the tongue is red and dry; the patient complains of thirst, the skin is hot, and she often suffers from an extreme agitation and restlessness. Towards the end of the paroxysm, a profuse perspiration generally breaks out, which seems to be the prelude of a notable amelioration. Then these general phenomena become moderated, together with the uterine pain, but they reappear with the latter, after a variable period, ranging from a few hours to several days.

1. *Influence of Rheumatism over the Progress of Gestation.*—The paroxysms are apt to be followed by uterine contractions in those cases in which they have persisted for some time, or have been very severe; and in this manner they may serve to bring on a premature delivery. The patient experiences some acute and tensive pains, but this feeling of tension is not uniform; for it attains, in turn, a high degree, and then becomes weaker in the same proportion, progressing in this way with shorter and shorter intervals. At first the uterus is indurated to a partial extent, but afterwards throughout; the os uteri dilates, though its dilatation is at first slow and difficult, and its ulterior progress does not seem to correspond with the intensity of the pains. An abortion is then imminent, but it is far from being so frequent as might be supposed; and when it does occur, it is more frequently observed in the febrile than in the apyretic form of rheumatism. The orifice has been known to dilate to the extent of an inch in diameter, and then the bag of waters, that had previously engaged in this opening, insensibly retreated, the os uteri again closed up, and the delivery did not take place. Consequently, so long as the dilatation of the os uteri does not amount to two inches, we may reasonably hope to make the labor retrograde. These uterine rheumatic pains may simulate those of parturition, and thus lead the accoucheur to suspect that labor has regularly commenced, when in fact such is not the case. The characters of the rheumatic pain, furnished in the following paragraph, will aid in preventing such an error. It is probably to some mistakes of this kind that we must refer those pretended instances of prolonged gestation, as well as those cases in which genuine labor was developed, and afterwards suspended during several weeks, and even months.

2. *Influence of Rheumatism over the Labor.*—As a general rule, a rheumatic affection of the womb retards the progress of the labor, and sometimes even renders the spontaneous expulsion of the child wholly impossible. Besides the general phenomena already pointed out, the disease here gives rise to the following peculiarities:

1st. It is well known that the normal uterine contraction only begins to be painful when it has accomplished the greater part of its course, and when it is at the point of distending and dilating the uterine orifice; in other words, the true labor pain only commences at the instant when the power of the body of the womb overcomes the resistance of the neck. In rheumatism, on the contrary, the uterine contraction is painful from the very first, and prior to any action upon the cervix; hence the cause of the pain is not in the violent distension of this orifice, but rather in the uterine contraction itself, in the other morbid conditions, and in the altered relations of the nerves and contractile fibres of the uterus.

2d. In a normal labor, the contractions begin at the fundus, and terminate at the inferior segment of the womb; in rheumatism, instead of starting at the fundus, they begin in the painful point, and are not regularly propagated towards the cervix. Again, the rheumatic pains exist prior to the contraction of the womb, and then speedily acquire a high degree of intensity under the influence of this latter. At times their violence promptly arrests the contractions, even before they have traversed their ordinary cycle. They are then rapid, short, and become more and more distant.

3d. Towards the end of labor, at the time when the uterine action ought to be aided by the voluntary contraction of the abdominal muscles, the woman refrains from exerting these under the fear of augmenting the pains, whereby an excessive slowness in the labor results. The patient is found in a state of extreme anxiety, and the frequency of her pulse, the heat of the skin, the thirst, and vesical tenesmus, are all greatly augmented. Where these sufferings are much prolonged, she falls into a state of swooning, which often proves serviceable, as the pains are suspended while it lasts; a profuse perspiration has then been observed to take place, which had the most salutary influence over the ulterior progress of the parturition. But at other times the uterus becomes more and more painful, and it is rather in a state of permanent contraction, or of fibrillar vibration, than of normal contraction; the pulse is accelerated, and the woman is affected with a metritis which renders the labor extremely painful.

3. *Influence of Rheumatism over the Puerperal Functions.*—The reader will anticipate from the foregoing that rheumatism of the womb may prove a source of difficulty in the delivery of the after-birth, by determining irregular or partial contractions of the organ immediately after the expulsion of the child; but that subject does not claim our attention at the present time, and it will be reverted to hereafter. In the healthy state, the uterus retracts after the delivery, and thereby prevents the development of hemorrhage. But in rheumatism, this retraction of the organ is very imperfect, and it remains much larger than usual; the after-pains are then very distressing, and are prolonged for some time; the uterine vessels are less compressed than usual, and profuse floodings may thence result. On the other hand, the suffering state of the organ diminishes both the lochial discharge and the lacteal secretion; and this, together with the persistence of the abdominal pains, and a manifestation of the phenomena of general reaction, may be mistaken for a peritonitis which does not really exist.

Prognosis.—Rheumatism of the womb is not a disease capable of determining the loss of the mother's life; nevertheless, from the pain that it occasions, and the errors it may give rise to in practice, it does not the less merit a careful study; because, during pregnancy, it may prove to be a source of abortion, and though it is not often manifested until after the sixth month, yet it is always an unfavorable circumstance to the child to be born before term. We have already spoken of the unfortunate influence it may have over the course and character of the labor-pains; in fact, it has often rendered an artificial delivery imperative. It may also complicate the delivery of the after-birth, and disturb the order of the phenomena that constitute the lying-in. At that period it has often been mistaken for true inflammatory symptoms, and, consequently, has been combated by measures that were more dangerous than useful.

As regards the period of manifestation, it is generally more unfavorable when it occurs at an early stage of the gestation; both because it then has a greater influence over the pregnancy, which has not become firmly established, and because it has a tendency to return several times before term. Besides which, most women, who have been affected during the gravid state, likewise find it to reappear again in the course of parturition, which is thereby rendered laborious.

Treatment.—1st. The measures that have most frequently been attended with success when administered for this disease during the gestation are: general venesection; the intestinal revulsives, such as castor-oil and ipecacuanha; bathing, narcotized lotions over the abdomen, opiated mixtures, and sudorific drinks; and in those cases in which the uterine affection had succeeded the sudden disappearance of a rheumatic pain in some other organ, the application of revulsives over the part primarily affected. 2d. During the labor, the same means are employed; but if they fail, and the degree of dilatation of the os uteri be such as to permit an artificial

intervention, either the forceps or version should be resorted to, according to circumstances. 3d. After the delivery, sudorific drinks, opiated unctions over the belly, and baths; and when the lochial discharge has failed, leeches to the vulva, and ipecacuanha combined with opium.

ARTICLE X.

OF DISPLACEMENTS OF THE UTERUS CONSIDERED IN REFERENCE TO THE ACCIDENTS THEY MAY CAUSE DURING PREGNANCY.

§ 1. PROLAPSUS OF THE UTERUS.

We have already seen, in studying the situation of the uterus at the different periods of gestation, that at first this organ sinks lower in the excavation, and that its orifice approaches the vulva. Now this first degree of depression may be considered as physiological, but it cannot pass beyond that without giving rise to some accident or other. Hence, laying aside all causes foreign to pregnancy, the uterus descends the more in the earlier months of gestation in proportion to the larger size of the pelvis, and the greater relaxation of the ligaments. In some women it rests on the floor of the pelvis, whilst in others, the neck, or even the body, may protrude through the vulva and become visible externally.

We see, therefore, that either a simple descent or an incomplete or complete prolapsus may occur during pregnancy, as well as in the non-pregnant condition. The complete prolapsus, that in which the entire body of the uterus is external to the genital parts and hangs between the thighs, is extremely rare. It were wrong, however, to deny its possibility, since this is proved by a case reported by Vimmer.

These displacements may occur either slowly or suddenly, though the female may have had nothing of the kind previously; sometimes, however, they are but the continuation or exaggeration of a pre-existing prolapsus. Although the progressive development of the uterus generally removes the incomplete prolapsus about the fourth or fifth month, by causing the organ to rise above the superior strait, the displacement, in some cases where the pelvis is spacious, may continue, and even increase, notwithstanding the progress of gestation. I have, quite recently, had under care at the Clinique, a very remarkable case of incomplete prolapsus, in which the entire neck of the uterus projected beyond the external parts, the whole excavation being occupied by the lower part of the body distended by the fœtal head. The displacement continued until delivery without any serious accident supervening.* It had existed for several years.

In some cases the displacement increases considerably, and either as an effect of its own weight, or in consequence of exertion or violent exercise, the lower part of the body of the uterus projects beyond the vulva, the upper part of the organ being still within the pelvis.

The disorders resulting from this displacement vary in intensity according to its extent and the stage of pregnancy at which it occurs. When the pelvis is too spacious, the excess of size affecting chiefly the excavation, whilst the straits preserve their normal dimensions, the uterus may remain much longer in the lesser pelvis than is usual in well-formed women. It then incommodes the neighboring parts, pressing upon and irritating the rectum and the bladder; the patient suffers from a feeling of weight at the anus, and painful tractions in the groins, lumbar regions, and umbilicus. A more or less abundant and fetid discharge also comes on; the woman can neither stand nor walk without suffering, and she falls gradually into a state of marasmus.

When the gestation is more advanced, and the womb increased in size, or even if less voluminous, but more depressed, the symptoms, such as complete retention of the urine, very obstinate constipation, etc., are still worse; finally, the pressure of the uterus on other organs may react on itself, and the consequent irritation thus prove a cause of abortion.

When the retention of the urine is complete, either the catheter should be at once resorted to, or the womb be pressed up by one or two fingers previously introduced into the vagina; but even this assistance will not be necessary, if the woman lies down and elevates her hips considerably whenever she wants to urinate. All these symptoms, however, disappear about the fifth month, when the uterus, on account of its great development, can no longer remain in the excavation, and therefore rises above the superior strait.

In cases of simple and incomplete prolapsus, some authors recommend the introduction of a pessary, in order to sustain the uterus, and prevent its prolapsing completely. I regard the pessary as always useless and often dangerous. Rest in bed, and proper cleanliness, seem to me capable of preventing the precipitation of the organ, and of alleviating the painful irritations which the displacement produces.

Certain instances of success seem to authorize attempts at reduction in cases of incomplete and complete prolapsus occurring at an advanced stage of pregnancy. In both circumstances I think that these attempts should be moderate, since they appear to me likely to compromise the gestation. When the prolapsus is complete, the

* The following are some of the details of this interesting case: Marie ——, aged twenty-seven years, entered the hospital October 18, 1849. She was then at the beginning of the ninth month of her pregnancy. Four years previously she became pregnant for the first time, and when near delivery, she both felt and saw a small red tumor, of about the size of a walnut, escape through the vulva. It projected but slightly, incommoded the patient but little, and did not interfere with the labor at all, since the latter was accomplished quite rapidly. After her confinement, she continued to feel the same tumor, less prominent, indeed, than during pregnancy, projecting and disappearing according as she was quiet or took long, fatiguing walks. Under the latter circumstances she suffered much from sensations of dragging in the groins and upper part of the thighs. She was habitually and obstinately constipated, and sometimes had great difficulty in urinating.

Two years ago the same person became pregnant the second time, and during the first three months the tumor became gradually more projecting, and hung very low—so low, she says, that a midwife, after having returned the parts, applied a pessary, which produced discomfort, and was retained but two days. Eight days after the introduction of the pessary, she miscarried, at about three months and a half to four months. The midwife who attended her could not extract the placenta, and, two days afterward, a physician endeavored to deliver it, first with the hand, and afterwards with forceps, but could obtain only some fragments.

She recovered entirely; the tumor remaining within whilst quiet in her chamber, but appearing externally after much walking.

Becoming pregnant for the third time, the tumor did not incommode her much more than usual during the first three months, but after the fourth it projected much more from the vulva, and towards the last three months it was impossible to restore it for several days, even after observing the most absolute repose in bed. At present, the patient being eight months and a half gone, the following may be observed:

A cylindrical tumor, two inches in length, projects from the vulva; it is five inches in circumference, and rather larger and harder at its lower than at its upper extremity. Its external surface is marked at the union of the two upper thirds with the lower one by a whitish circle, dividing two surfaces of different color and appearance. The superior is of a rosy hue and smooth, being only the internal surface of the vagina inverted from above downwards, which thus forms the external surface of the tumor. The inferior portion is of a deeper red color, and presents wrinkles or folds, directed from above downwards, and from within outwards, and separated on the median line by apparently longitudinal fibres. These folds are merely the arbor vitæ of the neck inverted from below upwards, so that the internal surface of the cavity of the neck has become a part of the external surface of the tumor to the extent of five-eighths of an inch. The somewhat swollen lower extremity of this tumor presents an opening, with wrinkled edges, resembling the drawn mouth of a purse, and into which the finger enters with ease. This is the cavity of the neck, forming a canal two inches and three-quarters in length, through which the membranes and a hard body, recognized as the head of the fœtus, may be felt. The internal orifice is quite largely dilated, that is, nearly to the size of a one-franc piece. The entire head is discovered to be in the excavation, and altogether behind the symphysis pubis, by which it seems to be arrested.

If it be attempted to enter the vagina, at the same time traversing the circumference of the upper part of the tumor, a cul-de-sac is reached at a depth of from two inches and three-quarters to three inches and a quarter on the sides, from two and a half inches to three inches and a quarter behind, and from only two to two and a half in front, when the examination is stopped by the walls of the urethra, which are thickened and curved, as it were, posteriorly.

danger to which the woman is exposed by the nature of the displacement itself would certainly authorize rather greater perseverance; but it is easy to see that in the latter months it will rarely be possible to return the uterus within the pelvis.

When the reduction is impossible, the uterine tumor should be supported by a proper bandage, and the female confined to the horizontal position.

In women who have had a falling of the womb before impregnation, there is reason to fear that it may persist and augment during the first three or four months of gestation, in consequence of the great laxity of the ligaments; and it is therefore prudent to advise such persons to keep the horizontal position during all this time, and not to permit them to get up until after the fifth month. After the delivery, they should again remain in bed six weeks or two months at least; for by such precautions, not only may the patient escape the dangers attendant on a prolapsus uteri during the earlier periods, but sometimes even a radical cure of the disease she had before the gestation took place may be effected.

§ 2. Retroversion.

The mobility of the uterus in the pelvis, which is still observable in the early stages of pregnancy, notwithstanding its augmentation in volume, exposes it to another variety of displacement, that is not so common as the preceding, but more disastrous in its consequences. Thus, in some instances, the womb seems to execute a sea-saw movement, by which its long vertical axis is brought into a nearly horizontal line in the excavation, in such a way that the fundus remains either a little more elevated or else somewhat more depressed than the neck. This displacement is called *retroversion*, when the fundus uteri is carried backwards into the hollow of the sacrum, and *anteversion*, when it is directed towards the symphysis pubis. These two varieties may occur in different degrees; but the displacement will be much more considerable in retroversion than in anteversion, on account of the anterior concavity of the sacrum; the former is also more frequent and serious than the latter.

Finally, in the latter part of gestation, the uterus may incline more or less to the right or the left, so as to constitute what have been termed lateral obliquities.

[If we may credit M. Salmon (of Chartres), who has published an excellent thesis for the "Concours" on the subject, retroversion of the uterus during pregnancy is not a very uncommon occurrence. Having already met three cases in our own practice, we are the more ready to accept his opinion as probably correct. It usually happens between the third and fourth months, and is rare before the third and after the fifth months. The observed cases occurred much more frequently in those who had already borne children, than in those who were pregnant for the first time.

As the displacement may be gradual or sudden, we may describe it according to its character in these respects.

The causes of gradual retroversion are: the normal inclination of the fundus of the womb toward the hollow of the sacrum in early pregnancy; the more rapid development of its posterior surface at the same period; a spacious pelvis, as insisted on by M. Chailly; the constant pressure upon the fundus by the abdominal viscera; and above all, a collection of fæces in the sigmoid flexure, of the colon, and retention of urine. Numerous discussions have taken place in regard to the effect of retention of urine in the production of this displacement, some thinking that the retention is an effect and not the cause, whilst others believe that distension of the bladder, so far from producing, would actually prevent the occurrence of retroversion. We agree with those who regard retention of urine as the principal cause of the gradual displacement, basing our opinion upon the fact that, by frequent emptying of the bladder by the catheter, the displacement will be spontaneously removed. As other causes of this occurrence during pregnancy, we have noted a previous retroversion, the growth of abdominal tumors and adhesions resulting from an old peritonitis, etc.]

When the retroversion occurs suddenly, it is produced by the same mechanism, only a more vigorous and energetic impulsion is then requisite; and such an impulsion is usually given by a rapid, violent contraction of the muscles: thus, after a severe retching, or vomiting, or after the strainings at stool, in women who are habitually constipated, or in urinating, in cases of retention, the womb is often found displaced.

M. Moreau relates an instance of a woman who lifted a weight of fifty pounds, for the purpose of placing it on the balance, when she was immediately attacked by pains in the hypogastrium, vomiting, syncope, etc. On his arrival, he found the uterus completely turned backwards; but all these symptoms disappeared immediately after the reduction was effected. A fall backwards, or blows, or a strong pressure below the navel, have very frequently caused the same result. (Nægèle.) In one of Hunter's cases, the retroversion appeared soon after a severe fright.

"A woman," says M. Martin, of Lyons, "was taken in her third month, after a violent straining effort, with pains, accompanied by loss of blood; at first, the os tincæ was found in the *centre* of the vagina; but the patient renewed her efforts, and then the uterus became completely retroverted; that is, the neck was placed behind

This cul-de-sac is formed by the vagina turned inside out from above downwards; and any effort to push it upwards is soon arrested by the fœtal head, which is plunged into the excavation, and rests upon the floor of the pelvis.

The patient suffers from obstinate constipation, and sometimes only from difficulty in passing urine, which escapes by jets.

To recapitulate, we find: 1. A descent of the womb, which seems to be retained in the pelvis only by the floor of the latter, and the pubic arch and symphysis, against which it rests; the rectum and urethra are also compressed. 2. Prolapsus of the neck of the uterus outside of the vulva, carrying with it the vagina, which covers its upper part like the inverted finger of a glove, and which is itself inverted from below upward to the extent of five-eighths of an inch, so that its internal surface forms the external surface of its lower extremity; this extremity of the neck forms the expanded and wrinkled portion of the tumor. 3. Constipation and difficulty in urination caused by pressure.

The tumor increased about three-quarters of an inch in size from the 20th of October to the 3d of November; but its volume was much greater in consequence of the œdematous condition of the prolapsed parts.

After some fruitless efforts to reduce the prolapsus, I concluded that it would be best not to try any further, but to limit treatment to evacuation of the bowels by mild laxatives, the patient being unable to receive enemata, a bath every two or three days, and frequent lotions and injections. Assisted by the horizontal posture, these measures completely relieved the patient of her sufferings.

At noon on the 3d of November the waters came away without pain, after efforts at defecation. The internal orifice of the cervix was of the size of a one-franc piece; the neck was rather longer than before the 3d, and rather softer. During the last ten days the patient felt her abdomen become harder from time to time, but without experiencing the least pain.

From noon until ten P. M. the pains were very weak and distant. From ten o'clock to three A. M. (of the 4th) they became greater, more powerful and frequent. Finally the labor terminated at three A. M. the 4th of November, after a labor of fifteen hours, if the time be reckoned from the rupture of the membranes and discharge of the waters, and only of five hours, if counted from ten P. M., at which time there was no change in either the length or dilatation of the neck, though then it was that the pains became well marked and regular.

The following are the principal phenomena which accompanied the expulsion of the fœtus: At the commencement of labor, the neck remained external precisely as before, and when the head came to be expelled, it dilated visibly, and was the last obstacle which this part had to overcome. No resistance was offered by the vulva, which was traversed before the external orifice of the neck of the uterus.

The child, which was a male, was born alive. Its weight and dimensions were as follows:

Weight	5½ lbs. (Troy).
Total length	1 foot 6 inches.
From the crown to the umbilicus	9 "
From the umbilicus to the heel	9 "
Occipito-frontal diameter	4 "
Occipito-mental "	5 "
Bi-parietal "	3⅜ ".
Sub-occipito-bregmatic diameter	3½ "

The day following the labor the cervix projected to the same extent outside the vulva, and the parts were rather more flaccid; the engorgement being dissipated, the neck was returned within the vagina; the patient continued in the horizontal position, and a month after left the Clinique without the neck having appeared at the vulvar opening.

the pubis and a little to the right, and the fundus of the organ rested against the sacrum. In this instance the retroversion evidently resulted from the conjoint influence of the uterine contractions and the expulsory efforts of the abdominal muscles." (Martin, *Mémoires*, p. 142.)

Where the displacement is effected slowly, the woman is but little incommoded at first; and the necessity for reduction is only apparent after it has become considerable. Originally, there are only some painful dragging sensations in the groins and lumbar region; a feeling of weight and pressure on the neck of the bladder; some vesical tenesmus, and a little difficulty in the emission of urine. But when the uterus attains a certain degree of development, all these phenomena increase, and we are then obliged to interpose the resources of our art; for when matters reach this state the womb becomes wedged, as it were, in the middle of the pelvis, and even more firmly so afterwards, because its volume augments rapidly; for not only does the fœtus continue its growth, but also the uterine walls become engorged, tumefied, and inflamed, and the symptoms caused by this inflammation are added to those previously existing; and, further, as the space then occupied and filled up by the uterus is larger than the superior strait, the reduction becomes very difficult, or even impossible. Hunter relates a case in which the reduction could not be made, and the woman died in consequence; and at the autopsical examination it was found necessary to cut through the symphysis, in order to disengage the womb from the excavation.

When the displacement takes place suddenly, all these symptoms are speedily manifested, and should it happen at an early stage, they are shortly carried to the highest degree, or even may soon prove fatal, for their persistence may give rise to so great a distension of the bladder as to produce its rupture.* Again, the accumulation of fecal matters in the intestine occasions so imperious a feeling of tenesmus that the female gives way to the most immoderate strainings; and the pain caused by the displaced and inflamed uterus may create a convulsive agitation of the abdominal muscles and the vaginal walls, so great as to cause a rupture of the vagina, and an escape of the fundus of the uterus from the vulva; as happened in the case communicated to M. Dubois by M. Mayor.

["Palpation of the abdomen," says M. Salmon, "is usually the first thing resorted to by physicians when called to a case of retroversion. The patients generally both know and say that they are pregnant, so that when the abdomen is examined in order to ascertain the cause of suffering, a large tumor reaching from the pubis to the umbilicus is almost always detected. This tumor is superficial, fluctuating, and dull upon percussion. It may bear no inconsiderable resemblance to the uterine globe, especially should it harden at intervals, as in one case which came under our notice. That the tumor is formed by a greatly distended bladder, is proved by the use of the catheter: it is important, however, not to be deceived by the statements of patients, who often believe that the bladder is empty because they are able to discharge a small quantity of water.

"Palpation of the abdomen is also useful in those rare cases unaccompanied by a distended bladder; for here the displacement of the uterus is indicated by the impossibility of detecting the fundus of the organ on a level with or below the superior strait of the pelvis." (Salmon.)]

The vaginal examination, in such cases, will enable us to detect the particular variety of displacement which causes the symptoms, for the finger encounters a tumor just within the vagina that fills the whole excavation, which is the posterior surface of the womb. In passing over this surface, which is of greater or less extent according to the stage of pregnancy, the finger reaches the fundus of the uterus, which it finds directed toward the anterior surface of the sacrum, and in more serious cases toward the point of the coccyx. Pursuing the examination anteriorly, the neck is discovered to be turned directly forward, toward the middle of the posterior surface of the pubis, and sometimes even raised above the upper edge of the symphysis. The displacement may indeed be so great that the axis of the organ is almost completely overturned and the finger cannot reach the external orifice. Sometimes, however, the neck is very accessible to the touch, although the retroversion is carried to the greatest extent. This is owing to the fact of the cervix being bent round on the body, like the beak of a retort. In this case, the uterus was retroflexed before being overset backward.

In retroversion, a rounded tumor, varying in size with the volume of the displaced organ, is found in the vagina. This tumor spreads out more behind than in front, whereby the posterior vaginal wall is depressed, whilst the anterior is distended and elevated. Sometimes the perineum is prominent, and the vulva swollen; the rectum is pressed down and almost obliterated by the tumefied organ, and the anus often dilated and bulged outwards.

[Unpleasant to the patient as is examination by the rectum, it must be had recourse to when the indications derived from the above-described measures lead one not merely to suspect, but to feel certain that the retroversion exists. It is the only method by which the uterine tumor can be explored over a considerable extent of surface, as there is nothing to prevent the finger from passing deeply behind it. Another advantage is, that whilst the vaginal touch enables us to appreciate better the position of the cervix at the bottom of the long cul-de-sac, behind the pubis, examination by the rectum affords precise knowledge of the character of the tumor formed by the fundus of the womb. (Salmon.)]

A particular variety of retroversion has been described by M. Martin, of Lyons, in which the os tincæ protrudes from the vulva, and the fundus uteri is pushed to the side of the sacrum; the uterine neck, being curved like the spout of a ewer, is situated below and a little in front of the pubis; the body of the organ is retained in the sacral excavation, and lies close to the perineum. But, after carefully reading his description, I do not think it can be justly considered as a new example of retroversion. I believe it was merely a falling of the womb, which had existed prior to pregnancy, and had been aggravated by this latter condition; there was at the same time an anteflexion of the neck, which explains how the curve in the latter, described by M. Martin, might be formed below and in front of the pubis, from the depressed body forcing it beyond the vulva.

A retroversion could scarcely be confounded with simple prolapsus; for, in the former, the vaginal wall is always situated between the finger and the tumor, and the neck is high up behind the pubis, whilst, in a prolapsus, the cervix is always the most dependent part, and the tumor can be perfectly isolated from the vagina; in the latter case, the reduction is generally easy, but it is usually quite difficult, sometimes even impossible, in the former. Further, the symptoms of retroversion are ordinarily much more severe than those of prolapsus.

[Without going into any detail on the subject, we would point out the possibility of mistaking a retroverted pregnant uterus for an intra-uterine fibrous tumor, abdominal tumors, or tumors of the cavity of the pelvis. The differential diagnosis between the unimpregnated uterus when retroverted and the same organ when similarly displaced during pregnancy may also prove somewhat difficult; still, the fact of the case may be generally arrived at by judging carefully of the size of the womb, and interrogating the patients in regard to the time of the last menstrual flow. It would be easier to make a mistake in cases of extra-uterine pregnancy developed in the utero-rectal cul-de-sac, or of retro-uterine hematocele; in this case, however, the entire uterus is crowded out of position without being tilted, and it is often easy to feel its contour above the margin of the pubis.]

*The greatly distended bladder may then doubtless form a very considerable tumor, capable of increasing the retroversion mechanically, and of opposing the reduction. But the very intimate adhesions, by which the anterior and posterior surfaces of the uterus are connected with the posterior and inferior walls of the bladder, tend especially to augment the difficulties. The abnormal size of the latter organ keeps it very high in the pelvis, and the neck of the uterus evidently can only be brought downwards and backwards, after the relieved bladder has itself descended into the excavation.

As a general rule, the prognosis in these displacements is very grave; it varies, however, with the period of pregnancy, the volume of the uterus, the alteration in the neighboring parts, and the violence of the attendant symptoms.

Cæteris paribus, a retroversion is usually more unfavorable than an anteversion; because, in retroversion, the constipation and retention of urine, which thus far have been considered as comparatively unimportant, soon become aggravating circumstances of the disease. In fact, the bladder can only enlarge and ascend into the abdominal cavity, by pushing the uterine neck upwards and towards the front; and hence, its body acting on the uterus by its size and weight, necessarily increases the displacement. The stercoraceous matters accumulated in the rectum, above the part in contact with the fundus uteri, act in a similar manner; and, again, all the woman's expulsory efforts have a constant tendency to further depress the fundus, after the displacement has once commenced. In anteversion, on the contrary, all the causes just enumerated operate in a favorable manner. Thus, the distended bladder constantly has a tendency to press back the body of the womb, which is then carried forwards, and the accumulated matters of the large intestine, pressing from above downwards on the posterior part of the neck, contribute to the same end.

[Sudden retroversion is more threatening in appearance than the gradual form. Both cases are serious in proportion as the pregnancy is in a more advanced stage, because the accidents which are liable to occur, and the difficulty of reduction, increase with the size of the uterus. Independently of the accidental or gradual cause which produced it, and of the period of gestation at which it occurred, the danger, says M. Salmon, is in proportion to the importance acquired by one of the principal phenomena of the affection, viz., retention of urine. If the latter be complete, the symptoms become urgent in seven or eight hours, but if incomplete, the displacement may continue for fifteen, twenty, or twenty-five days without causing any serious results.

Retroversion generally terminates in recovery, though it may give rise to abortion. In some cases death may ensue from peritonitis, beside which rupture or gangrene of the bladder, or rupture of the uterus, or its partial destruction by gangrene, may be apprehended.

Treatment.—In the first place the bladder must be emptied, as in its distended condition it would interfere with the attempts at reduction. It sometimes happens, indeed, that after the urine is withdrawn, reduction occurs spontaneously. Many practitioners have very justly insisted upon the advantage of catheterism repeated several times daily through the course of several days, as the only method of treatment; it has very often proved successful, insomuch that Burns felt authorized to say that retroversion would rarely last over a week, if the bladder were emptied three or four times a day. It is a course, therefore, which may be followed whenever the symptoms are not urgent.]

Treatment.—After having emptied the bladder and rectum, and combated the inflammatory symptoms by the appropriate means, the accoucheur should proceed at once to reduce the uterus to its natural position, and secure it there. The best position for the female to assume is one in which all the muscles are thrown into a state of relaxation; two fingers are then to be introduced into the vagina, with which the body is first to be pushed up, after which the index should be hooked over the neck so as to depress it.

The reduction may sometimes be effected on a single trial, but usually we are compelled to repeat the attempt after an interval of a few minutes; and just at the instant of the resumption of its ordinary position by the womb, a noise is heard, in some instances, like the click of a spring. It must not be supposed, however, that this operation is always an easy one. For the difficulty in using the catheter, so often experienced, the impossibility of emptying the rectum, and especially the voluminous tumor formed behind the uterus by the fæces collecting in the sigmoid flexure of the colon, the violent strainings made by the patient under such circumstances, and the size of the tumor, and its adhesions to surrounding parts, are so many embarrassing circumstances to the practitioner. Although it is very seldom that we cannot succeed in introducing the catheter, by time and patience, yet in some cases this has been found altogether impossible; indeed, much prudence is requisite in the measures then adopted, and if they all prove useless, a moderate pressure made over the hypogastrium may, perhaps, slowly compress the bladder, and thus make the woman urinate, so to speak, by disengorgement.

The retroverted fundus sometimes compresses the rectum to such a degree that an injection cannot be made to enter the large intestine.

Such cases demand some precaution in the administration of the enemata. There may be a collection of indurated matters above the fundus of the retroverted uterus, in which case it is evident, that, as the latter compresses the upper part of the rectum, an injection given in the usual manner cannot reach high enough to bring away the fæces accumulated in the descending colon. It then becomes necessary to use a long gum-elastic tube, which may be inserted to the extent of seven or eight inches. This simple expedient has often disencumbered the intestine of matters which an ordinary injection could not have reached, with the effect of producing spontaneous reduction.

Even with the use of the tube just recommended, the injections are sometimes ineffectual. In such cases, if the palpation and the abdominal percussion lead us to suspect a considerable accumulation of fecal matters in the descending colon, we should exhibit purgatives by the mouth. Again, the necessary introduction of the hand into the vagina, to effect the reduction, is at times so painful to the female, that, notwithstanding all persuasions to the contrary, she gives way to the most violent bearing-down efforts, which neutralize those of the operator. If baths, or emollient and narcotic injections, should not assuage this acute sensibility, the advice of Dewees might be taken, and bleeding practised to the extent of producing syncope; still better, in my opinion, would be the administration of chloroform before the operation.

The abnormal adhesions that are occasionally established between the uterus and adjacent parts, will certainly add another to the serious difficulties just mentioned; but even this should not give rise to despair. Amussat reports a case where he distinctly felt some bridles in the bottom of the vagina, and to the left of the tumor, into which he could hook the forefinger, but after a careful examination he acquired the conviction that the uterus was free on the right side. He then renewed his attempts, by acting in such a way as to turn the uterus from the opposite side towards that where the adhesions existed; that is, from right to left, and he thereby succeeded in replacing the organ in its natural position. But if, after having adopted all suitable precautions, the simple procedure just described should not succeed, one of the following plans should then be resorted to, namely, to act simultaneously by the vagina and rectum, as some have advised; but the most simple plan, however, is that of M. Evrat, quoted by M. Moreau, as follows: The woman must lie upon her side, and the accoucheur then takes a rod eight or ten inches long, covered at one end by a tampon of linen smeared over with some fatty matter, which he introduces into the rectum so as to press, through the recto-vaginal septum, the fundus uteri from below upwards, whilst the two fingers passed into the vagina hook the neck, and simultaneously draw it downwards and backwards. The force necessary for this reduction is very variable, though in effecting it we need not be restrained by the fear of producing an abortion; for, even if this were to result from such efforts, the dangers to the mother would be far less than from the continuance of the retroversion. In a case of this kind, M. Halpin, after having emptied the bladder, and endeavored unsuccessfully to reduce the uterus, came to the conclusion that the only mode of curing the patient was by the employment of an instrument that would bear equally on all parts of the displaced womb; and he imagined that the pelvis could be filled up with a bladder, and thus all the contained organs be pressed up together into the abdomen. With this view, he placed

an empty one between the fundus uteri and the rectum, and then by cautiously distending it, he actually succeeded in pushing the fundus upwards.

Attributing, as they did, the difficulty of reduction to the pressure of the viscera upon the anterior surface of the uterus, Hunter, Boyer, and others have recommended that the patient should be placed in such a position that the weight of the intestines may be supported by the upper part of the abdomen. Acting upon this suggestion M. Godefroy adopts the following position: the patient rests her head and hands upon the floor, whilst the anterior part of the thighs and legs repose upon the edge of the bed, where they are supported by assistants. The surgeon then acts either through the vagina or the rectum upon the fundus of the uterus in such a way as to effect the reduction. In three very grave cases success was complete. (*Journ. des Conn. Méd. Chir.*, August, 1846.)

This position is very fatiguing, painful, and disagreeable to the patient. I would, therefore, much prefer, in these difficult cases, simply to place the female on her knees in bed, with the upper part of the body supported on the elbows. I have thus been able, in two cases, to reduce retroflexions which had resisted every other means.

In an obstinate case we might resort to a procedure recently employed by Amussat, with a prospect of success: that is, to place the female in the position for operating for stone, and then introduce one or two fingers into the rectum, and gently press up the uterine tumor, by following the concavity of the sacrum, at first directly upwards, and then alternating from right to left and left to right, so as to raise the whole surface of the uterus; but if the finger or fingers placed in the rectum cannot reach so high, the thumb should be put into the vagina so as to elevate the perineum, in order that the former may penetrate still further; and, lastly, to get higher yet, an assistant might press against the elbow, or the accoucheur himself could sustain it with his own thigh or body. M. Amussat declares that he has twice succeeded in this manner in making a reduction that had previously been ineffectually tried by several other practitioners.

Finally, what is to be done where the reduction is impossible? Abandon the patient to the resources of nature, says Merriman; but would not that devote her to a certain death, in case the inflammatory phenomena did not determine an abortion? And since a miscarriage is inevitable under the most fortunate circumstances, would it not be advisable to bring it on, rather than to leave the patient exposed for a long time to the dangers which threaten her? Indeed, most physicians are of this opinion, and I should not hesitate, therefore, to rupture the membranes by a sound passed through the neck of the womb. But, sometimes, the neck is so high up that it is wholly inaccessible; and then a puncture of the uterus itself must be resorted to. This latter operation has been performed both by the vagina and by the rectum, but I should think the first preferable. It is, without doubt, the last resource, but always ought to be chosen rather than the symphysiotomy recommended by Gardien and some other accoucheurs.

After the reduction (when that has been possible), the patient must remain in the horizontal position until towards the sixth month of pregnancy, and must carefully avoid all straining, whether in urinating or at stool. These simple precautions are all-sufficient, and generally render the introduction of a pessary useless; which latter, however, Baudelocque considers indispensable in most cases. Occasionally the incontinence of urine, brought on by the pressure which the neck of the bladder has suffered from the neck or fundus uteri, may still continue some time after the reduction; and then, if the ordinary simple means do not cause its disappearance, we may resort to the warm mineral waters of Cauterets, Bareges, or Balaruc; to frictions with the tincture of cantharides, and blisters on the hypogastrium, together with tonics and astringents administered internally.

§ 3. Anteversion.

Anteversion is very rare in the early stages of gestation, and, probably on this account, has been passed over by most authors who have studied the disorders of pregnancy. The manner in which the uterus is developed, the peculiar form of the anterior and posterior boundaries of the pelvis, and the normal direction of the organ, are so many circumstances which, just in proportion as they facilitate retroversion, render the occurrence of anteversion difficult. Besides, the influence which a distended rectum and bladder have in the production and increase of the posterior displacement, would tend to restore the womb to its natural position, should any circumstance effect a commencement of anteversion.

Notwithstanding these favorable conditions, anteversion has been observed by Chopart at two months, by Madame Boivin at three months, and finally by Ashwell. The case of the latter being unknown in France, we shall give an analysis of it. I have myself twice detected it at two months in cases of women affected with incorrigible vomiting.

Mrs. M——, thirty-three years of age, and habitually very constipated, fell, during the first month of her pregnancy, whilst descending a pair of stairs. Though there was no hemorrhage, she had a spell of faintness which lasted nearly an hour. For five or six weeks there was a feeling of weight at the pubis, micturition was frequent and painful, but there was no obstruction to defecation. I examined her for the first time at the end of the second month. The cervix was in its normal position, but the strongly inclined fundus formed a round solid tumor between the bladder and the anterior part of the vagina. Pressure with the finger upon the angle of inflexion caused pain. The neck was elongated, and larger and harder than usual. I endeavored, ineffectually, to effect reduction by pressing upon the fundus of the womb with the finger, whilst the neck was drawn downward and forward by the index of the right hand. At the sixth month the husband found that the anteflexion had almost entirely disappeared, and although the lady still suffered some pain in the latter months, she was delivered without difficulty.

Although the author describes this as a case of anteflexion, it is evident that there was also anteversion, as is proved by the normal position of the neck, and especially by the spontaneous disappearance of the displacement at the fourth month. I see, indeed, no reason why an anteflexion should disappear suddenly at this stage of pregnancy.

Anteversion is, therefore, possible in the early months, though it occurs more frequently in the second half, and especially towards the end of the pregnancy. At that time the fundus of the womb, which is naturally inclined forwards, is supported by the abdominal muscles only; now if these resist slightly, as often happens when women have had several children, the physiological inclination has a constant tendency to increase. The axis of the uterus may thus become nearly horizontal, or even be depressed still lower, until the fundus falls upon the thighs and knees. The neck, which is carried very far upwards and backwards, sometimes gets above the sacro-vertebral angle, and is reached by the finger with the greatest difficulty; the impossibility of attaining it has occasionally given rise to a belief of the existence of imperforation.

Beside the signs furnished by the touch and examination of the abdomen, some functional disorders may be produced by anteversion at different stages of pregnancy, whose cause should not be mistaken when called upon to treat them. In the early months the sensation as of a heavy weight at the pubis, frequent and sometimes painful micturition and defecation, are almost the only rational signs. In the latter months the weight of the uterine tumor, which is carried strongly forwards, occasions pains and draggings in the thighs and groins; the extreme distension of the skin of the abdomen, also, produces acute pain, and the pressure to which the bladder is subjected is the cause of vesical tenesmus, with dysuria or strangury. Finally, in the worst cases, walking is rendered difficult and often impossible.

The prognosis is not generally serious; for, when the anteversion occurs in the early months, the development of the uterus may restore it; when it occurs in the second half of gestation, it may produce premature labor, though it usually occasions merely the in-

conveniences just spoken of, and never gives rise to accidents in any degree serious, except during labor.

Reduction may be attempted in the early months, but has hitherto always failed; too great perseverance would be at the risk of abortion. The most prudent course, therefore, provided resistance is encountered, is to intrust the reduction to the subsequent progress of the pregnancy. If the discomfort and weight are too fatiguing, they may be relieved by the horizontal decubitus.

At a more advanced stage, a body bandage, or a sort of corset or belt for the abdomen, well adapted to the size and form of the belly, will afford much relief. When the abdomen is pendent, the abdominal belt may be kept up by suspenders.

§ 4. Lateral Obliquities.

In describing the physiological phenomena of pregnancy, we spoke of obliquities of the uterus, and pointed out their probable causes. They are rarely carried to any great extent, and are never the occasion of serious accidents. Only by tending to produce an unfavorable presentation of the child, and by retarding the dilatation of the neck, can they have any unpleasant effect upon the labor. Therefore, the present is not the proper time to speak of them further.

CHAPTER XI.

DISEASES OF THE OVUM.

ARTICLE I.

DROPSIES.

§ 1. Dropsy of the Amnion.

The amniotic liquid may sometimes augment to a very considerable quantity; but, as the normal amount is very variable, it is difficult to say above what limits it should be considered as a disease; however, when it exceeds three or four pounds, the accumulation may be justly attributed to some morbid condition.

In the present state of our science, it would be absolutely impossible to designate the cause of this singular affection, although some facts seem to militate in favor of its being produced by an inflammation of the amnion; but this opinion requires further confirmation to be received without hesitation, for, notwithstanding Dr. Mercier claims to have seen the internal surface of the amnion covered several times by false membranes, and the membrane itself highly injected, yet other observers have not detected anything of the kind. (*Journ. Gén. de Méd.*, tom. xiv.)

Again, from the cases cited by Drs. Merriman and Lee, it would appear that a dropsy of the amnion is often associated with a morbid condition or a bad conformation of the fœtus, or with a state of general infiltration on the part of the mother; indeed, some facts would lead to the supposition that constitutional syphilis predisposes to this disease.

In a few instances, it has seemed referable to sanguineous plethora; but as it occurs in women of every variety of condition, constitution, and age, this cannot be considered as a fixed rule on this point. It is much more frequent in twin pregnancies, and rarely supervenes prior to the fifth month.

In some cases, the dropsy is preceded by all the signs of an active inflammation; but most commonly a dull pain in the uterus, a feeling of weight about the pelvis, and a rapid growth of the organ, are the only evidences of its existence. The womb speedily acquires a considerable volume, and is more distended at the fifth or sixth month than it usually is at term. Further, the development is proportionate to the quantity of liquid: thus, the latter often amounts to five or six pints; and Baudelocque reports a case in which thirteen pints escaped from the uterus, and another one of thirty-two pints. Certain authors have even known forty or fifty pints to exist in the amniotic cavity. The fluid is similar in all respects to the liquor amnii.

The uterus rarely becomes much enlarged without disturbing the functions of the thoracic organs in the manner heretofore described, and facts are not wanting to prove that it may even produce asphyxia.

In a case reported by Duclos, the distension of the womb was so great, although the gestation had only advanced to the seventh month, that it enlarged the abdomen beyond measure, pushed up the diaphragm, and interfered so much with the respiration and circulation that the woman's life seemed to be seriously compromised.

The physicians, called in consultation, decided in favor of bringing on the uterine contractions as soon as the neck showed any evidence of dilatation; but, suffocation being imminent, M. Duclos ruptured the membranes, at first permitting a certain quantity of fluid to escape, then, by keeping his fingers in the neck, he prevented its complete evacuation; and thus, for four times, after intervals of fifteen minutes each, he allowed a further flow, while slight pressure was made over the abdomen. In this manner, fourteen pounds were collected, without counting what was lost. The symptoms disappeared immediately, but as the uterus did not appear capable of any effort, and the neck offering no resistance, it was easily dilated, and a living infant brought away by the forceps. The child was feeble and diminutive, and its limbs were very small. The mother recovered.

M. Evrat, Sen., of Lyons, has published several cases of almost complete asphyxia (lividity of features, cessation of pulse and respiration), in which the women were rapidly restored by the puncture of the membranes and discharge of a large amount of water.

A premature distension of the uterus by amniotic dropsy, to the size which it usually has at the end of gestation, is capable of producing dangerous symptoms. It is astonishing, as Scarpa remarks, that in cases of dropsy complicating pregnancy, the womb should occasion symptoms of suffocation which it never determines at the end of the ninth month, though its size be the same. It is explained by the sudden and rapid development in the first case; whilst in the latter the distension takes place almost imperceptibly, the walls of the abdomen yield gradually, thus allowing the uterus to project more in front, so as to diminish its elevation slightly, whilst it crowds much less upon the diaphragm.

As before said, ascites often coexists with the amniotic dropsy; but as the two diseases may occur separately, it becomes important to establish their differential diagnosis.

In ascites complicating pregnancy, the urine is small in quantity, whitish, and turbid, the thirst great and constant, and the lower extremities and genital parts mostly much infiltrated. It is difficult and sometimes even impossible to distinguish the shape and fundus of the uterus, on account of the irregular form of the belly, and the enormous distension of the hypochondriac regions. Percussion produces an undulation, or sort of fluctuation, which is much more perceptible at the upper than at the lower part of the abdomen.

In dropsy of the amnion, the size of the belly approaches much more nearly that of a uterus at term, although the pregnancy may

not have existed more than five or six months. The uterus is so rounded as to be almost spherical. Fluctuation is more obscure, thirst slight or absent, urine natural, and in some cases little or no infiltration of the lower extremities. The umbilical tumor is rarely present, and, when it exists, has not the transparency observed in ascites.

The great enlargement of the womb often provokes premature contractions and abortion. Sometimes the child is born living, but so little developed that it cannot survive; more frequently, it dies in the mother's womb, and is not expelled until some time after.

Dropsy of the amnios, which is so grave as regards the infant, rarely compromises the mother's life, or even her health. Some unfortunate cases have, however, proved fatal, though generally she is merely incommoded by the excessive volume of the womb, and the consequent interference with other organs. The expulsion of the liquid is generally spontaneous; the fœtus, membranes, and placenta passing away with the waters; whence, the cause no longer existing, the disease is completely cured.

According to some authors, the rupture of the membranes and consequent expulsion of the fluid is not always followed by the birth of the child. In this case, the breach in the membranes takes place at a point considerably above the neck, the uterus is relieved slowly of the superabundant fluid, and the pregnancy proceeds with no other accident than a more or less frequent discharge of water. I think that, in most of these cases, an accumulation of fluid between the membranes and the uterus, as in the hydrorrhœa to be spoken of hereafter, has been mistaken for amniotic dropsy. I confess, however, that the following case, carefully observed by Ingleby, leaves hardly a doubt as to the possibility of the fact: A lady, six months gone in her third pregnancy, lost suddenly a large quantity of water during the night. From this moment until the termination of pregnancy there escaped every two or three days a pint and a quarter of fluid. The woman was delivered of a large boy. The after-birth was expelled spontaneously. I received it in my hand, says the author, so as to avoid laceration of the membranes. I examined it with the greatest care, and discovered, besides the opening made by the head in the centre of the membranes, a second opening, of circular form, near the edge of the placenta. It was doubtless through the latter that the fluid escaped from time to time.

It is proved, by many observations, that amniotic dropsy frequently recurs in the subsequent pregnancies of the same female.

A remarkable circumstance, pointed out by MM. Bunsen and Kill, and one instance of which has come under my own notice, is a dropsical condition of the fœtus, it being sometimes affected with hydrocephalus, and at others with ascites.

The same authors also mention having observed that in these cases the placenta was often remarkably large. Thus, in a case reported by M. Kill, in which the extreme distension of the uterus produced abortion at the sixth month, the circumference of the placenta was a third larger, and its thickness double that of ordinary placentas. It was pale, and its tissue spongy, and, when divided, the vessels traversing its substance were found to have almost the size of the arteries and umbilical vein.

The abdomen of the fœtus contained a large amount of fluid. The liver was voluminous, occupying almost the whole abdominal cavity. Its structure was normal, without any indication of swelling, but its vessels were highly developed.

This great size of the liver is supposed by the authors quoted to be connected with the extreme development of the placenta, whose enlarged vessels would of course supply a great quantity of blood to the umbilical vein. (Churchill, page 50.)

When the malady is once established, it is exceedingly difficult to find the proper remedies,—I will not say to cure, but even to impede its course;—for instance, diuretics have usually proved of little value. Some authors, indeed, seem to have observed good effects from dry diet; and Burns specially recommends cold bathing. But, in spite of all we can do, the affection ordinarily goes on increasing until the commencement of labor; and in the greater number of cases there is nothing to be done except to await this event. However, if the uterine tumor be of excessive size, more especially should the dropsy of the amnion be complicated with ascites and a general infiltration, and the patient's life be endangered by the obstructions to the hæmatosis, an evacuation of the waters should be determined upon by rupturing the membranes.

The puncture is usually effected by the use of a male or female catheter, or a stylet, which is introduced through the neck, and the membranes perforated with its extremity. When the cervix is sufficiently dilated, the rupture may be performed with the finger. When not obliged to act quickly, contractions may be previously solicited by introducing and leaving a piece of prepared sponge in the cavity of the cervix, or by practising some douches upon the inferior segment of the uterus. But should the gravity of the symptoms demand immediate intervention, there would, I think, be some advantage in following the advice of M. Guillemot, and to glide the catheter between the ovum and the uterus, so as to pierce the membrane far above the neck; this process would permit the discharge of the fluid to be controlled, and only the superabundance, so to speak, to be withdrawn. The pregnancy may afterward be left to itself.

In case of complete obliteration of the neck, paracentesis by the vagina and in the vicinity of the uterine orifice must be performed. Scarpa and Camper recommend puncturing between the umbilicus and pubis. In one of the observations of Evrat, Sen., the operation was practised in the place, so called, of election, for paracentesis. The patient was delivered eight days afterward of two living children, and recovered perfectly. The details given by the author do not inform us whether the case was one of ascites, or really of amniotic dropsy, as he thought.

The vaginal puncture seems to me likely to subject both mother and child to the fewest risks, whenever the neck is inaccessible.

§ 2. Hydrorrhœa.

The Germans have given this name to those discharges of water that occur in the course of the gestation, but which, in general, are neither preceded nor followed by any uterine contractions; their nature is such as to interfere but slightly with the pregnancy, the latter advancing as usual to term, and at the accouchement the bag of waters is regularly formed.

This affection is quite common in the latter months, but very rare at the beginning of gestation. I observed it once between the third and fourth month, and it reappeared but once during the remainder of the pregnancy, which terminated happily.

The frequency of such discharges, and the quantity of water lost each time, are exceedingly variable in different cases. Sometimes the liquid comes away in gushes, at others drop by drop; but the amount may increase in an incredible manner, and the loss may occur but once, or be renewed frequently. Further, the intervals of its appearance are very irregular, and lasting a long time when it does come on, during which any mental emotions or bodily excitement singularly influence the profuseness of the discharge. On the other hand, it augments in quantity during the most perfect quietude, as, for instance, at night during sleep; its cause can rarely be ascertained.

Most generally, the female enjoys her usual health before the discharge comes on, when she unexpectedly finds herself wet, the fluid escaping drop after drop, or else she hears the peculiar sound caused by the sudden irruption of a considerable quantity of the waters. In most cases, she suffers no pain either pending or after this discharge; though it may happen that a too rapid depletion of the uterus, and the consequent parietal retraction, may bring on some slight uterine contractions; but if the patient then keeps perfectly still, they soon disappear, and everything resumes its natural order. In color, the discharged water is usually a little yellowish, very limpid, and at times tinged with blood, leaving stains upon the linen, and having a well-marked spermatic odor.

Should the hydrorrhœa be attended with the uterine pains, it would be an evidence of an approaching abortion; and some accoucheurs, supposing the membranes had been ruptured, have been

known, under such circumstances, to use every effort to accelerate and to terminate a labor which really had not commenced, and which, without their interference, would not have occurred before the ordinary period.

[We saw a case of hydrorrhœa during the sixth month of gestation, in which uterine contractions had come on and almost completely effaced the neck of the womb which was opened to the size of about a franc-piece. Rest in bed and opiate injections quieted the threatenings of abortion, and the patient was delivered at term.]

This error may be avoided by attending to the fact, that, notwithstanding so considerable a flow of liquid, the size of the uterus, its consistency and elasticity, are such as it generally presents at that period. These remarks will at least be sufficient to excite a doubt as to the true source of the waters; and from the moment that there is a doubt every effort should be made to prevent and not to hasten abortion.

These fluids, although having no relation in their seat to the liquor amnii, have, however, been called the *false waters*, so as to distinguish them from those which escape after the membranes are ruptured in labor.

Various opinions have been advanced as to the nature and seat of these false waters; thus, certain accoucheurs have supposed that they were contained between the chorion and the amnion, and that their escape is due to a laceration of the chorion; others, that they are owing to the rupture of an hydatid, lodged either in the cavity or the neck of the uterus (Bœhmer, Rœderer). Again, Baudelocque was of the opinion that it resulted from the transudation of the liquor amnii through the membranes. Some others explain it by invoking an œdematous condition and an infiltration of the uterine cellular tissue. It is an easy matter to refute all these opinions by recalling the fact of the frequency and abundance of the discharges, which often come away in large quantities. Mauriceau, Camper and Capuron supposed that these waters proceed from the interior of the amnion; for, in certain cases, they say, the membranes may yield at a point quite distant from the neck, and the superabundance of this fluid will then gradually drain away, though still an abortion may not occur.

This explanation is not applicable to the greater number of cases of hydrorrhœa, for observation does not show that when water came away several times during pregnancy the amount lost during labor was less than usual: beside which, careful examinations of the membranes after delivery have very rarely detected traces of old rupture. Some well-observed cases, however, prove that Mauriceau's opinion may be exceptionally true.

It is much more probable that the fluid which thus escapes in the course of gestation, sometimes a few days only before term, had accumulated between the internal uterine surface and some portion of the membranes (variable in extent) that were detached. This is the view advocated by Nægele, and it has been lately reproduced by one of his pupils in a thesis sustained at Heidelberg, from which I have derived most of these details. That is to say, the fluid secreted by the internal surface of the organ gradually detaches the membranes, thereby forming a pouch for itself until its constantly increasing quantity succeeds in separating them as far as the neck, when an irruption of the liquid takes place.

This theory was confirmed by the autopsy of a pregnant woman affected with hydrorrhœa. Dr. Duclos, of Toulouse, who relates the case, found the membranes partly detached and from that point the fluid escaped. Elsewhere the membranes were raised by an accumulation of fluid between them and the uterine wall, being thus ready, so to speak, to give rise to a fresh attack of hydrorrhœa whenever the detachment should extend to the cervix.

Now, if we admit with Professor Burdach, that an exhalation takes place from the internal surface of the uterus, which, by transuding through the membranes, reaches the amniotic cavity, and thereby contributes to the nutrition of the fœtus during the greater part of the intra-uterine life, it would be easy to explain this abnormal accumulation of fluids, either by an excess of secretion or an arrest of transudation. It may also be explained by supposing that the secretion continues beyond the ordinary term, and the liquid is obliged to create a cavity or a kind of reservoir for itself by detaching the membranes to a certain extent.

Generally speaking, this is not a serious affection; nevertheless, if frequently repeated, it might bring on premature contractions.

The treatment is very simple. The patient must maintain the most perfect rest, avoiding all moral and physical excitement during the flow, and for seven or eight days after it has ceased. Should it be followed by slight contractions, enemata, containing laudanum, would arrest them; and if the discharge is accompanied by any evidences of general or local plethora, these symptoms must be promptly met by the appropriate measures.

[§ 3. Dropsy of the Villi of the Chorion. Hydatiform Mole.

The villi of the chorion sometimes become distended by fluid which collects within them, causing them to swell and assume the form of rounded vesicles, comparable to gooseberries or grapes, and having, consequently, some resemblance to hydatid vesicles. On account of this analogy they were, for a long time, supposed to be true hydatids. M. Velpeau was the first to discover that the hydatiform mole has its origin in the chorion, and the microscopic examinations of Prof. Robin exhibited still more clearly the true nature of the disease by showing that the envelope of the hydatiform vesicles have all the anatomical characteristics of the walls of the villi of the chorion. It is now regarded as certain that the disease known as hydatiform mole is nothing but a dropsical condition of the villi of the chorion.

Though the affection is a rare one, we have a good account of it in Dr. Cayla's thesis, which we have found very useful in the preparation of this article.

If an ovum, presenting the alteration in question, be examined, the villi are seen, as usual, detached from the surface of the chorion. In some cases the pedicles will have undergone no change in size, whilst at others they will be slightly dilated. The dilatations, or vesicles, begin to appear where the ramification commences, the branches of the villi being found swollen at intervals. The dilatations vary in size from that of a walnut to that of a filbert, and so down until they become almost invisible to the naked eye. A whole villus is often almost completely metamorphosed into a bunch of vesicles almost as large as gooseberries. Upon the larger of these smaller ones are often inserted, and generally by a very fine pedicle, a portion of the undilated branch of the chorion. The pedicle varies from ·039 to ·078 inches in length. Sometimes it is extremely fine, but may reach a diameter of ·039 inches; in which case it allows the fluid to flow through it from one vesicle into the other. More frequently it is obliterated through a greater or less extent of its course. All the vesicles of the same group are, therefore, connected by pedicles, forming groups of the strangest appearance, but, nevertheless, recalling that of the villi in the normal condition.

It is generally easy enough to separate the vesicles from each other, and to trace the pedicles down to the chorion; sometimes, however, they are inextricable.

The fluid contained in the vesicles is usually colorless, transparent, liquid as water, and containing albumen in solution. Occasionally the contents are of a reddish color.

This dropsical condition may affect either the villi of the chorion, properly so called, or those of the placenta, and in both cases the life of the fœtus is nearly always compromised. The dominant fact in the affection is, after all, the arrangement of the umbilical vessels. Should all the villi become dropsical, the death of the fœtus would necessarily ensue, and, occurring at a period very near that of conception, it might undergo solution in the amniotic fluid, and thus disappear.

Should the alteration of the villi be more recent or less complete, we should have an embryonic mole, in which the body of the fœtus would present various grades of development. Sometimes even, though rarely, when the alteration affects a small number of villi,

the fœtus may be fully developed. Finally, a case of M. Brachet's proves that a few hydatiform vesicles occurring on the placenta do not prevent the birth, at term, of a healthy child of the usual size. It is certain that in twin pregnancies an alteration of one ovum may affect the other injuriously; still, some cases, reported in the Dictionary, in thirty volumes, show that one ovum may be transformed into a hydatiform mole, whilst the other fœtus undergoes regular development, and is born at term.

By what symptoms may dropsy of the villi of the chorion be suspected or discovered? If the alteration be slight, none of the usual signs of pregnancy will be wanting, and then a diagnosis will be almost impossible. If, on the contrary, the change is so great as to completely alter the ovum, the affection may be suspected and occasionally discovered. All writers admit that attacks of hemorrhage are common in such cases, and they almost always coincide with an unusual development of the uterus, whose size is no longer in conformity with the presumed period of gestation. These two symptoms are found conjoined in a case of M. Depaul's, already published by M. Cayla. The most important sign, however, is a too rapid increase in the size of the uterus, and by it was a positive diagnosis made in the following case, which we owe to the kindness of M. Pajot, from whom we received it. The account will be read with interest: "I saw a case of so-called uterine hydatids in connection with Dr. Gocherand (of Ivry), and although it was the third one of the kind which has fallen under my notice, the circumstances attending it were very different from my own first two cases, and afforded the opportunity of studying a much greater alteration of the villi of the chorion."

The patient was a young woman who had given birth to a child about a year previously, and who now supposed herself to be about three months pregnant. On making an examination I was astonished to find the uterus as large as at the eighth month of gestation. A very marked sense of fluctuation made me at first suppose that there might be a collection of fluid or a rapidly developed cyst of the ovary. However, I soon became satisfied that there was an accumulation of fluid in the cavity of the uterus itself.

By vaginal examination I found that the lower segment of the uterus was considerably developed. The neck was as soft as at the eighth month of gestation, and presented the indications of a previous labor. The finger could be inserted as far as to the internal orifice, which was closed hermetically. By passing the finger around the cul-de-sac, the left hand at the same time being applied upon the fundus of the uterus, the sense of fluctuation already perceived so clearly by palpation was again evident. There was no solidity at any point of the abdomen. The patient's general health was bad; she had a dry, hot skin, and pulse at 120.

It was the only one of the three cases in which a diagnosis could be established.

I advised the insertion of a gum-elastic catheter through the internal orifice, and the administration of ergot. The advice was followed the next day, and the patient expelled, together with a large quantity of fluid, a multitude of hydatiform vesicles, either in a detached state or in clusters of five or six together. The entire collection would have filled a man's hat. The vesicles were taken to Paul Dubois, who showed them to his class, and made them the subject of a lecture.

The evacuation was followed by no improvement in the general symptoms; the patient continued to lose strength, and died a few days after the operation. Unfortunately, an autopsy could not be obtained. (Pajot.)

Although the uterus, in these cases, is generally too large for the stage of the pregnancy, it is sometimes in the opposite condition. (Thesis of Dr. Louvet-Lamarre.)

The pregnancy usually terminates earlier than in normal cases, expulsion of the ovum generally taking place before the sixth month, and in the usual manner; all the symptoms which precede, attend, or follow it resembling precisely those of abortion, though the accompanying hemorrhage is commonly profuse.

The formation of an hydatiform mole rarely appears to have any effect upon the general health of the patient, or upon subsequent pregnancies. Madame Boivin, however, mentions some cases of women who were so unfortunate as to suffer repeatedly from the affection.

ARTICLE II.

LESIONS OF THE VILLI OF THE PLACENTA.

Although changes in the structure of the placenta are quite common, our knowledge of them is as yet so limited, that in a work like the present we shall be able to notice only the most important of them.

A clear statement of what may be said of the pathology of the placenta makes it necessary to revert to some details respecting the chorion and its villi. The two latter are composed of the same substance, that is to say, of a membrane formed of polyhedral cells, which are easily distinguished up to the sixth week. At a later period their nucleolus disappears, the nucleus loses its transparency, and the cell itself becomes filled with granules. In this way the chorion soon assumes the appearance of a continuous membrane, which is more or less granular and sprinkled with nuclei.

In its beginning the chorion has the form of a regular hollow sphere, with smooth outlines; soon, however, its surface becomes covered with multitudinous prolongations, to which the term villi has been applied. Almost all these prolongations are traversed by a canal, which terminates in a cul-de-sac at the free extremity of the villus, but opens freely at the internal surface of the chorion. This internal surface is, therefore, covered with minute perforations, each communicating with the canal of its respective villus. When the allantoid is formed, it becomes applied against the internal surface of the chorion, and quickly sends vascular prolongations into most of the villi. Some of these villi then continue to grow, so as to form the placenta; the rest become atrophied in a way which has been well described by Robin (*Archives Générales de Médecine*, 1848, *et Gazette Médicale*, 1854), and which affords the key to some of the lesions of the placenta. Prof. Robin's investigations may be recapitulated as follows:

1. During the formation of the villi the development of some of them is arrested, so that they contain no central canal, and consequently can have no participation in the allantoid circulation. They appear as solid cylinders, having imbedded in their tissue an abundance of grayish granules.

2. Although most of the villi are provided each with a canal, some of them fail to receive a prolongation of the allantoid; these, consequently, remain tubular, and are distinguished by the abundance of fatty molecular granules, with which their parietes are sprinkled.

3. Although nearly all the villi become vascular at a certain stage in the development of the ovum, most of them have become atrophied by the time the placenta is distinct. In following up this process of atrophy, the allantoid vessels traversing the villus are first observed to disappear, and the canal is quickly obliterated, being filled with a tissue resembling the reticulated magma. The walls of the villus itself become charged with fat in the shape of fatty granules and real oil-drops, sometimes scattered and sometimes in collections of various forms.

4. The placental villi occasionally present the same indications of atrophy as are constant in the other villi in the chorion; in other words, the placental villi may undergo atrophy, cease to be vascular, and exhibit an abundant fatty deposit in their walls.

We shall soon explain the mode by which the normal atrophy of the villi of the chorion gives rise to important lesions when it happens to extend to those villi which go to form the placenta.

FIBROUS OBLITERATION OF THE PLACENTAL VILLI WITH OR WITHOUT FATTY DEGENERATION.

The lesion in question has been described as *induration of the placenta*, *encephaloid*, *scirrhous*, *cancerous*, *tuberculous*, and *fatty*

degeneration: still oftener has it been mistaken for a fibrinous deposit, the remains of a placental apoplexy. (See *Placental Apoplexy.*)

The degeneration appears in the form of grayish or whitish masses, which are always less red and moist than the rest of the placenta, and of a tissue which is hard, compact, friable, and but slightly stringy. This appearance has caused them to be mistaken for concrete pus, masses of crude tubercle or scirrhous formations. When, however, they are examined under the microscope, it is soon seen that all the parts of the tissue thus altered are composed of obliterated villi of the chorion with their tissue charged with fatty granules. All the ramifications, however, are not thus supplied with fat, since in the parts apparently the most diseased and distinguished by their whitish color, the villi contain no trace of fat granules, or have them only at long intervals. In a word, the lesion which we are describing is characterized by obliteration of the placental villi, precisely similar to the atrophy which invades the villi of the chorion after the formation of the placenta, and which we have described above.

This alteration is more especially met with at the circumference of the placenta, the cotyledons in that situation being the ones chiefly affected. It may always be found in the cotyledons of the periphery, or, at least, in a small portion of some of them: in this case, however, the affected ramifications of the chorion are lost, as it were, in the midst of those which remain pervious, and in this degree the disease is of no interest to the clinical observer.

In certain placentas, however, there will be one or several portions of cotyledons, or even one or several entire cotyledons, which have undergone fibro-fatty degeneration; and sometimes even the greater part of the placenta is thus transformed into a morbid tissue which is impervious to blood.

A placenta examined by MM. Laboulbène and Hiffelsheim had six of its cotyledons entirely obliterated, beside which there were discovered eleven other small, yellowish masses, presenting the same external characters and structure as the diseased cotyledons. The altered cotyledons are sometimes scattered through the placental mass, at other times they touch by their edges, but are always definitely separated by deep furrows. The change is generally more evident upon the uterine surface of the cotyledons than upon the side of the chorion, for there the tissue resumes gradually its softness, humidity, and reddish hue.

"If the placenta be emptied of blood," says M. Robin, from whom we borrow almost the whole of this article, "the diseased cotyledons will project more than the healthy ones; but if the placenta be injected, the former will be depressed in comparison with the latter. This result is due to the fact that the ramifications which remained vascular in the emptied placenta subside in consequence of the discharge of their blood; but as the obliterated ones do not collapse, their bulk remains greater than that of the others. When, on the contrary, the healthy and vascular cotyledons are distended by injection, they form a larger mass than those whose subdivisions are obliterated, and appear in relief beside them."

The alterations just described are independent of hemorrhage or placental apoplexy. Whenever the two affections have been confounded, the observers were, doubtless, deceived by their coincidence. It is, indeed, by no means rare to find an apoplectic space in the centre of the diseased cotyledons, large enough to contain a pea, a bean, or only a millet-seed, and the fibro-fatty degeneration of the villi has often been mistaken for a bleached clot. This confusion is now impossible, thanks to the microscope, which discovers in the mass of diseased cotyledons not a collection of fibrin, but a network of atrophied villi of the chorion.

A single argument remains in favor of the view which attributes them to apoplexy, to wit, that the hemorrhage which takes place causes the obliteration of the cotyledons. To us it seems impossible thus to make the obliteration subordinate to the apoplexy, and M. Robin's researches tend to prove that the fibro-fatty alteration may become a cause of hemorrhage as regards the neighboring villi which continue pervious. Moreover, as a matter of fact, placental apoplexy is met with, without obliteration of the cotyledons, and it is very often impossible to discover a trace of apoplexy in cotyledons which are completely obliterated. The two lesions are, therefore, mostly independent of each other.

Obliteration of the placental cotyledons is without importance as regards the mother, but, as will be readily understood, may be highly injurious to the fœtus. It is, indeed, proved that an almost constant relation exists between the weight of the fœtus and that of the placenta. Now in the case before us, any obliteration of the villi cuts off by so much the active portion of the placenta; if but a few villi be obliterated, the child experiences no bad effect from it, but if several cotyledons be altered, its development will be imperfect, and should half of the organ be invaded, its life will incur the greatest danger. In a still more advanced stage, its death is almost certain.

All our knowledge of the fibro-fatty degeneration of the placenta is, so to speak, condensed into the anatomo-pathological statement just given, and we are obliged to confess, as does Dr. Millet, whose excellent work may be consulted with advantage, that there is nothing to give us light upon the etiology of this lesion, no sign which enables us to fix its symptomatology upon a certain foundation. Sometimes, however, there have been evidences of uterine congestion in cases in which the patients had complained of weight or pain in the loins. These symptoms then resemble those observed in cases of placental apoplexy, and, we would observe, are really so vague or even insignificant that it would seem to us almost impossible to diagnose the fibro-fatty degeneration in a case of first pregnancy. As, however, the affection is liable to recur and sometimes adheres tenaciously to the same woman in all her pregnancies, the accoucheur may take warning and let the least trouble occurring either to the mother or fœtus during gestation have its weight in his estimate of the situation. M. P. Dubois says, in reference to these matters, that, if a sense of dull pain and fulness is connected with a slight diminution of the motions of the fœtus, there is reason to fear that it is in serious danger.

It is possible, then, to suspect or even to foresee the fibro-fatty degeneration of the placenta; but how shall it be prevented? What course shall be pursued if the woman becomes pregnant again?

M. Dubois' advice to his pupils, under these circumstances, is thus briefly stated by Dr. Millet: Advise the patient to avoid all kinds of fatigue: insist upon her lying down, and prescribe a light diet for the purpose of moderating the circulation. At the same time practise a revulsive bleeding to the extent of from one to two ounces, followed the day after by a similar one. In connection with this apparently reducing treatment, M. Dubois, without fear of being taxed with inconsistency, adds the use of iron, inasmuch as it has appeared to him that women are predisposed to the affection by a certain degree of impoverishment of the blood. The iron would, at any rate, seem in several instances to have benefited the patients.

ARTICLE III.

EFFUSION OF BLOOD IN THE PLACENTA.

Utero-placental hemorrhage will be studied in all its connections when treating of abortion or the hemorrhages accompanying delivery (see *Abortion* and *Dystocia*); we are, however, to speak in this place of certain effusions of blood in the substance of the placenta which present peculiarities deserving of special attention. These effusions differ considerably both in situation and form, the variety being due, for the most part, to the more or less advanced stage of the development of the placenta. Thus, if the blood occupy circumscribed cavities formed in the tissue of the organ, it takes the name of placental apoplexy given to it by M. Cruveilhier, and will be described in the next paragraph. Up to the third month, however, not only may the blood be effused into the

placenta itself, but may even extend beyond its limits and spread over the entire external surface of the chorion. This last variety will be the first to engage our attention.

As utero-placental hemorrhage has been so well treated of by M. Jacquemier, we can do no better than borrow several passages of his description. Up to the third month, as stated, the blood effused into the placenta has a great tendency to spread itself over the surface of the chorion; in fact, it could hardly be otherwise, for at the outset the placental villi are not yet connected by the amorphous tissue which at a later period forms of them compact lobes, and the circumference of the placenta is not yet well defined, there being no distinct limit between the villi of the placenta and those of the chorion, which latter are destined soon to disappear. The entire surface of the chorion is, in fact, at this time covered with prolongations which separate to a certain extent its external surface from that of the decidua reflexa until both membranes are brought into contact through the atrophy of the villi. Should a rupture now occur of some of the utero-placental vessels either in process of development or but recently perfected, the blood therefrom would soon reach all the vascular tufts of the placenta and villi of the chorion by spreading itself in a layer between the ovular decidua and the chorion. The aborted ovum under these circumstances often has a fleshy appearance, its surface being more or less bluish or blackish, whilst its walls form an envelope of variable solidity and thickness. If it be entire, a careful examination will often detect on the external surface of the placenta minute ruptures opening into cavities and closed or not by coagulated blood. Frequently, also, there is no rupture, although the placenta may contain deep-seated, circumscribed cavities or extensive diffused infiltrations. If the layers of the decidua be stripped from the ovum, the entire surface of the chorion, the portion occupied by the placenta included, will be found covered by coagulated blood which is firmly held by the vascular ramifications of the placenta and the villi of the chorion imprisoned in its substance. Both chorion and amnion are intact, the amniotic fluid having a slightly red color by imbibition. If the embryo be very young, it may sometimes be found to be entirely dissolved, the only trace left of its existence being a very small bit of the cord still attached to the placenta by a few fragments of a very soft tissue. At other times the amniotic fluid may merely seem to be a little thicker than usual, resembling in this respect a mucilage of gum. Should the structure of the embryo be firmer, it will be found in its normal condition, only more or less withered and macerated according to whether the date of its death be more or less remote. The blood covering the entire surface of the chorion sometimes forms a firm and hard coagulum, which occasionally in some parts has lost its color and resembles the buffy coat of blood from venesection; at other times it is soft and presents the appearance of a black, thick, and granular fluid.

The amount of blood effused varies greatly, and the layer formed by it may be only from ·068 to ·136 inches, or from ·78 to 1·17 inches in thickness. In the latter case, the ends of the villi will have lost their relation with the reflected and interutero-placental deciduas, thus producing an unnatural widening of the interstice, which, in the normal state, is very small. The layer of blood is not of equal thickness at all points; in some places it collects in larger quantity, and that most generally where the placenta would have been formed. Ova thus affected have, sometimes, another appearance; thus, if during their expulsion the decidua has been removed, as often happens, they look like a clot of blood, but dissection and washing soon discover in their tissue the vascular ramifications of the placenta and villi of the chorion, showing that the seat of the effusion is the same as in the preceding case, and that they are not merely ova wrapped in their deciduas and enclosed in a clot of blood.

At a rather later period of gestation, say the third or fourth month, the effusion spreads much less over the surface of the chorion and shows a tendency to be confined to the placenta; still, it will sometimes extend beyond the edges of the latter in the form of streaks, projecting in various directions to a greater or less distance. The limitation of the effusion is due to the approximation and somewhat firm adherence between the chorion and the decidua reflexa—due to the atrophy of the villi of the chorion, so that a space no longer exists between the two membranes except for a variable distance near the border of the placenta. Even should we suppose that these effusions exert a considerable force, it is not generally sufficient to rupture the membranous envelopes which restrain them. Still it is not so very rare for the decidua reflexa to give way and allow the blood to pass into the cavity of the decidua and even reach the internal surface of the uterus. As an exceptional occurrence it is sometimes found to have ruptured the chorion and amnion, as in the cases observed by M. Gendrin, who found blood effused between the chorion and amnion, and even in the cavity of the latter, where it enveloped the embryo completely. Within the periods of fœtal life above mentioned, there can be no doubt that the effused blood proceeds from a rupture of the utero-placental vessels, even though it be impossible to detect any lesion upon the external surface of the placenta. It is impossible to suppose that the blood comes from the umbilical vessels, for we have seen that in some cases the embryo is so slightly developed as soon to be dissolved, whilst in others the amount of blood effused generally far exceeds the entire bulk of the embryo. If the umbilical vessels are ever ruptured, they could only be so consecutively to rupture of the utero-placental vessels, in which case the fœtal and maternal blood would mingle together.

An occurrence of this kind happening to the extent just imagined, would, generally, be fatal to the fœtus, though the ovum would not be expelled until later. As the effused blood is not in contact with the walls of the uterus, it does not stimulate the organ immediately to contraction, and it very often happens that when abortion takes place the blood is found to have already begun to lose its color, as also to present other changes indicating that the hemorrhage must have taken place some time previously. Should the effusion be moderate, it would not seem impossible for gestation to continue. (Jacquemier.)

PLACENTAL APOPLEXY.

Mr. Jacquemier's book again guides us in describing placental apoplexy. From the middle of intra-uterine life the placenta continues to be quite frequently the seat of effusions of blood, which effusions are peculiar from the fact that they no longer extend beyond its edges between the now firmly united chorion and decidua. Instead of being diffused and occupying the greater part or even the whole of the placenta, these effusions are more fully circumscribed and confined to the lobes in which the ruptured vessels are situated, although they always show a strong tendency to extend toward the fœtal surface of the placenta. They also present varieties which may be described under three principal heads.

In the first variety there is no cavity, properly so called, produced, but the blood infiltrates the tissues of one or more lobes of the placenta, apparently diminishing its density. In some places it accumulates sufficiently to form little vacuoles filled with a very dark-colored fluid which in some cases has the appearance of a very thin jelly. (Jacquemier.)

In the second variety the effused blood forms a very irregular cavity, having prolongations in various directions, and the parts adjacent are infiltrated and stained of a reddish hue for a very considerable distance. The foci are usually quite large and mostly communicate with the external surface of the placenta through a rupture of greater or less size, with detachment of the parts corresponding; they are irregular in form and more liable to be found near the edge of the placenta in proximity to the coronary vein, which is sometimes ruptured, and communicating with the cavity. When the effusion takes place near the centre of the placenta it easily reaches the external surface of the chorion; and should it be near the point where the principal branches of the cord traverse the latter, a little blood will sometimes be found to have penetrated to a greater or less extent the tissues which surround the umbilical

arteries and vein at the root of the cord. This condition has already been described in several cases, of which one published by M. Gendrin is very interesting; the cord, for the distance of two or three inches from the cavity in the placenta, was infiltrated with blood, and yet there was no evidence of rupture of either of the umbilical arteries or of the vein. These irregular cavities in the substance of the placenta may be numerous, or there may be but one; and in case there are several, they may have been formed at the same period or at different times.

The third variety is the most remarkable of all; the cavities are here well defined and regular in form, even when the effusion seems to have occurred but very recently. Usually there are several of them, and judging from the appearance of the blood which they contain, they are produced successively. It is not uncommon to find seven or eight of them in the same placenta, and sometimes there are twenty or more. Simpson mentions a four months' placenta in which they were so numerous as to give the impression, upon dividing it, of a collection of innumerable, small, rounded and distinct clots, closely compacted together. (*Dictionnaire en 30 volumes.*) It is rare for the clots to be larger than a pigeon's egg; some are as small as millet or hemp seeds, whilst others are of intermediate size. They are also situated at various depths in the substance of the placenta, some extending to the internal surface, and others approaching the uterine surface, upon which some of them open by a small and irregular orifice. The surrounding tissue of the organ is in its normal condition, and the appearance of extravasation of blood extends for but a few lines beyond the boundaries of the cavities. These regularly formed clots begin to lose their color at the circumference, so that at a certain period the cavity exhibits a white, thin pellicle, which detaches more easily from the clot than from the placental tissue. (Jacquemier.)

We have hitherto said that the placental tissue surrounding the cavities is in a healthy condition; but this is not always the case. It will be remembered, indeed, that it is not uncommon to find apoplectic collections in the centre of cotyledons affected with fibrous obliteration of the villi. In such placentas occur very small, regularly formed cavities, enclosing clots of blood of an appearance compared by M. Jacquemier to black grape-seeds.

The blood effused in the tissue of the placenta, when the ovum is not expelled, separates into two portions, one solid, the other liquid. The serum disappears by infiltration, whilst the solid part, forming a clot, contracts, becomes denser and somewhat smaller, and gradually loses its color. The importance of the consecutive changes in the effused blood has, however, been greatly exaggerated; thus it was supposed that the transformation might be so complete as to produce whitish and homogeneous masses resembling concrete pus or tuberculous matter, but it is evident that in such cases effects have been attributed to placental apoplexy which were really caused by fibrous obliteration of the villi.

We have said that when utero-placental hemorrhage occurs in the first half of pregnancy it is occasioned by the rupture of some of the maternal vessels, generally the veins, and that it very rarely proceeds from the umbilical vessels. We think that the same observation applies to placental apoplexy.

The various kinds of apoplectic formations in the placenta may coincide with the lesion met with in uterine hemorrhages, whether internal or external; that is to say, with a partial or complete detachment of the placenta and the presence of a clot of greater or less size in the artificial cavity thus formed, together with streaks of coagulated blood stretching away to the cervix, and situated between the internal surface of the uterus and the uterine decidua. The ovum is then expelled prematurely, with the symptoms of an ordinary uterine hemorrhage. Effusions within the placenta, however, rarely occasion such extensive lesions, but are almost always limited and compatible with the continuance of gestation. The effect of placental apoplexy, moreover, varies with the period of gestation at which it occurs, as also with the number and extent of the effusions and the more or less frequent occurrence of the accidents. If the points of effusion are small and few in number, a considerable part of the placenta retains its natural structure and capacity for the fulfilment of its functions; in this case not only will the fœtus continue to live, but its nutrition will suffer little or not at all. Under opposite circumstances, if it should not die, it will be born feeble, puny, and emaciated. Should the apoplectic attacks recur at short intervals, they will often produce, in spite of all that can be done, gradual diminution of the motions of the child and of the pulsations of its heart, and the final cessation of both. In these unfortunate cases, it is not uncommon for both the mother and the accoucheur to be obliged to witness, as it were, the sufferings and death of the child. (*Dictionnaire en 30 volumes.*)

Apoplectic effusions in the placenta are rarely betrayed by any symptoms, provided the hemorrhage is limited in amount. In some cases, most of the indications of moderate internal hemorrhage are observed, though its occurrence will be rather a matter of suspicion than of certainty, unless the patient has suffered from the affection several times previously; for it is by no means rare for the same woman to miscarry several times consecutively, and always from the same cause; and if she should be delivered at term, a number of effusions, both old and recent, will be found in the placenta. (Jacquemier.)

Supposing there is reason to fear the occurrence of placental apoplexy, and especially if the woman is predisposed to the affection, the prophylactic treatment had recourse to in cases of uterine hemorrhage during pregnancy will be indicated. As measures offering the greatest chance of success, we would mention absolute rest and small bleedings, to be repeated at longer or shorter intervals.

CHAPTER XII.

DISEASES AND DEATH OF THE FŒTUS.

§ 1. Diseases of the Fœtus.

Although the diseases of the embryo and fœtus during intra-uterine life are numerous, they are very little known. As it does not enter into the plan of this work to treat fully of subjects coming under this head, the history of monstrosities and whatever else belongs to teratology will be laid aside, and we will merely present succinctly such diseases as are most interesting to the accoucheur on account of their endangering or destroying the life of the child. As we even think it best to defer the account of such as might obstruct natural delivery, until we come to treat of dystocia, our task for the present will be quite a limited one.

1. *Inflammation.*—Traces of inflammation have been detected in various organs of the fœtus. As the most important we would mention peritonitis, which was made the subject of a special treatise by our colleague and friend, Dr. Lorain. It was most frequently observed in lying-in hospitals during the prevalence of puerperal fever.

The pleura and lungs are sometimes attacked with inflammation,

though less frequently. But although rare in the human species, it is very common in animals affected with epizoötic pneumonia.

2. *Fevers.*—It would seem that the eruptive fevers may be communicated by the mother to the child. There can be no doubt of the fact as regards variola, and we have nothing to add here to what has been said elsewhere on the subject; and the same remark applies to intermittent fever.

3. *Icterus.*—Several observers have reported cases of women having icterus giving birth to children affected with the same disease, the waters also being of a yellow color. These are, however, exceptional cases, as it is far more common for children born of jaundiced mothers to be free from any abnormal color.

4. *Syphilis.*—We have already said that syphilis may be inherited. The fœtus thus affected usually undergoes a very regular development; and not until some weeks or months have elapsed after its birth, do the accidents appear which, therefore, it does not fall within our province to describe. This, however, is not always the case, for it is by no means rare for the syphilitic fœtus to be born prematurely or even to die before birth. These children, like the former, when examined immediately after delivery, generally exhibit no lesion which can be attributed to syphilis, though in some, traces of the disease are evident, the most common being pemphigus of the palms of the hands and soles of the feet. When the bullæ are perfect, the eruption is easily recognized, but they are almost always ruptured and their place occupied by rounded erosions with elevated epidermis. Still, they have a characteristic look. Pemphigus is more difficult to recognize when the eruption is beginning: it then appears in the form of small, red, and barely projecting spots, marked in the centre with a whitish point, due, doubtless, to a slight elevation of the epidermis. I have met with two cases of this kind, which are represented in wax models deposited in the hospital of the Clinique, and the reports of which were published by Dr. Bernardot (*Thèses de Strasbourg*).

Autopsies of the children sometimes reveal visceral lesions due to syphilis, such as certain alterations of the thymus gland, lungs, and liver. Prof. Dubois was the first to call attention to syphilitic alteration of the thymus gland. Externally the affected organ seems healthy, but if cut open and squeezed, a whitish fluid, resembling pus, exudes from it. When the lung is the seat of the lesions, these consist of indurated nodules varying in number and size, and of about the consistence of the liver, as stated in a detailed account of the affection by Prof. Depaul. Some of these indurated masses project beneath the pleura, under which circumstances they present quite a deep-yellow hue. At a later period they undergo softening and have at their centre a cavity containing a fluid of a sero-purulent appearance. The lesions of the liver have been well studied by M. Gubler, who describes them as being sometimes general, sometimes partial, and characterized by spaces of indurated yellowish hepatic tissue, whose normal structure is infiltrated with fibro-plastic elements and an albuminous fluid resembling the serum of the blood. The indurations are distinguished from the healthy tissue of the organ by their contour, hardness, and resistance to the finest injections.

5. *Spontaneous Fractures.*—Cases have been reported of spontaneous fractures, almost always multiple upon the same fœtus. Chaussier mentions a child born at the Maternity Hospital, in 1803, after a rapid and easy labor, during which no force had been applied to it, which had forty-three fractures, involving the cranium as well as other bones. Some of the fractures were recent, in some callus was forming, and others were thoroughly consolidated. Another case, cited by the same observer, is still more extraordinary. The child in question, which was born after an extremely short and easy labor, in a state of debility and of a bluish color, expired in a short time. Attention was attracted to it by its extreme shortness and an unusual mobility in the continuity of its bones. One hundred and thirteen fractures were counted by Chaussier, involving the different bones of the cranium, chest, and limbs (Jacquemier). The causes of this singular lesion are unknown; it is most probably due rather to arrested development of the bony tissue than to fracture properly so called.

6. *Complete or Incomplete Amputation of the Limbs.*—Cases not less curious than the preceding are those in which the children are born with limbs amputated at various heights, and having a cicatrix at the centre of the stump. Chaussier saw three deprived of the hand and a portion of the forearm. In one of these cases, a small bony cylinder found on the fœtal surface of the placenta was recognized as a portion of the radius. The stump, undergoing cicatrization, was covered at its centre with granulations. Watkinson, in 1824, attended a woman in her first labor who had experienced nothing unusual during her pregnancy. The child was born prematurely, and lived but twenty minutes. Its left leg appeared to have been amputated just above the malleoli. The foot, smaller than the other, was found in the vagina, but presented no appearance of gangrene or alteration of color or consistency. The two divided surfaces (of the foot and of the limb) were almost entirely cicatrized, and both presented small projections formed by the ends of the bones. Montgomery, in a work on this subject, relates two cases very similar to the preceding, in which the detached feet were expelled before the child. Cicatrization was complete in one, and far advanced in the other. (Jacquemier.) It would be easy, though I think useless, to mention other examples of this species of deformity.

Spontaneous amputation is sometimes incomplete; that is to say, grooves of greater or less depth, occasionally extending to the bones, are observed upon the limbs.

What is the cause of this singular lesion? Some have supposed it due to circular turns of the cord around the limbs, acting as does a ligature around the pedicle of a tumor; but it is very difficult to suppose that the cord could be drawn tight enough to amputate a limb without arresting the placental circulation at the same time. Montgomery's explanation is much more probable; he supposes the amputation to be effected by constricting materials other than the cord. In several cases were found fibrous bands, whose origin it is difficult to determine, which constricted the limbs as would real cords, and which would have occasioned complete or incomplete amputation according to the degree of constriction. It must, however, be said that these bands are not always to be found, so that the etiology of spontaneous amputation is very uncertain. It cannot be affirmed, says M. Jacquemier, that they are always the mechanical effect of a constricting agent; they may possibly be due to a deep-seated local lesion and to the constriction induced in the skin by an extensive cicatricial action.

§ 2. Death of the Fœtus.

The causes which destroy the life of the embryo and fœtus are numerous, but we shall not attempt to recapitulate them here, referring the reader to the chapters which treat respectively of the diseases of the mother and of the ovum and fœtus, as also to the article on abortion. It must, however, be confessed that it is often impossible to determine the cause of death or to discover anything which can explain it in a satisfactory manner. Some of these unknown causes have attracted attention by the persistence with which they continue to act in the same woman through several successive pregnancies. I myself knew a woman in good health, who, on thirteen consecutive occasions, and without any discoverable reason, lost her child during the last month of gestation. Since Denman's time, it has been supposed that in these cases recourse might be had successfully to the induction of premature labor. We would also revert to the fact that in twin pregnancies one fœtus sometimes dies and assumes a mummy-like condition, whilst the other undergoes its regular development. This occurrence can only be known after delivery.

It is not always easy to assure ourselves that the fœtus is dead; it will sometimes be suspected when it ceases to move, especially after having been unusually active. At other times, the spontaneous motions gradually grow less frequent and weaker, and finally cease. Too much importance ought not, however, to be attributed to this sign, because the fœtal motions present numerous anomalies,

even in the midst of the most perfect health. The surest indications are derived from auscultation of the fœtal heart. "In regarding the subject from this point of view," says M. Depaul, "we must set aside the first three months of gestation, during which the sounds of the heart cannot be heard, and also remember that in many cases it is impossible to perceive them before the expiration of the fourth month. During the last half of gestation, the conditions are altogether different, success in the stethoscopic examination being the rule, whilst failure should be regarded as a very rare exception. Inasmuch, however, as this exception may exist, it is impossible to attribute an absolute value to auscultation of the fœtal heart as a means of determining whether the child be living or dead. It would be a great mistake, however, not to regard it as an extremely valuable means, since, in the immense majority of cases, it leads to probabilities which amount almost to certainty, and consequently allows questions of the highest practical interest to be solved." (Depaul, *Traite d'Auscultation.*) Out of 67 women, more than five months pregnant, in whom M. Depaul was unable to hear the pulsations of the heart, but three were delivered of living children.]

Further, the phenomena experienced by the mother after the death of the fœtus are very singular in these cases: the abdomen collapses instead of increasing in size; the breasts, which had become developed, shrink; the woman suffers from a sensation of weight in the loins, and an unusual pressure in the lower part of the abdomen; an inert body in the uterus obeys the laws of gravity and falls to whichever side the woman turns in bed.

Other symptoms are soon added to the foregoing. If the gestation is somewhat advanced, everything passes off absolutely as if the expulsion of the embryo had occurred, only excepting the discharge of the lochia: thus, in the course of forty-eight to sixty hours after its death, the breasts swell up, the phenomena of milk fever are manifested, and the lacteal secretion is fully established, after which the breasts again subside, and the usual order is resumed. As a general rule, the prolonged retention of a dead infant does not produce any disastrous result to the mother, and I suspect that writers have greatly exaggerated on this point: they say, indeed, that the woman becomes depressed, uneasy, and of a fretful temper; that she experiences lassitude, alternations of heat and cold, oppression at the epigastrium, headache, syncope, palpitations of the heart; her face is pale, the eyes dull and surrounded by a livid circle, the breath fetid, pulse frequent and irregular: in a word, all these general phenomena of a slow fever have been considered by them as so many rational signs of the child's death. But these symptoms are certainly absent in the majority of cases; for most women, after we have succeeded in calming their fears, experience nothing of the kind, and I have known many of them to carry a dead child for several months without even suspecting it, and some even to congratulate themselves upon the amelioration of their general condition, in consequence of the sudden disappearance of the sympathetic disorders of pregnancy. At an indeterminate period labor comes on, and the abortion is effected.

By examining the dead fœtus, we may learn why its prolonged sojourn in the uterine cavity has been wholly innoxious to the mother. In fact, the infant is not putrefied, as is proved by its having no bad odor; the solid parts undergo a peculiar transformation, and the body is somewhat analogous in appearance to one that has been soaked for a long time in water.

When the fœtus remains in the uterus thoroughly protected from the air, it does not putrefy, but undergoes maceration. M. Martin (of Lyons) judiciously remarks: "The kind of alteration which a dead child undergoes in the womb, will also vary according to the period of pregnancy at which it ceased to live. Thus, in the early stage of its formation, when its organization has but little consistence, and approaches the mucilaginous state, it dissolves in the waters of the amnios, which then become thicker and assume the characters of a gummy solution, and no further trace of the embryo is found in the amniotic cavity. But at a period somewhat later, that is, from the second to the fifth month, it withers away, becomes shrivelled and dried up, and looks like a little mummy of a yellow color, or like a fœtus preserved for a long time in alcohol. Not unfrequently, the placenta likewise participates in this state of desiccation, the liquor amnii disappearing and being replaced by a thick and apparently an earthy humor, which incrusts the fœtus." (*Mémoires de Méd. et de Chir. Prat.*, page 96.)

After the fifth month, a child putrefied in the womb presents so different an aspect from one that has undergone the same process in the open air, that it is only necessary to observe this particular condition once or twice, never to mistake it afterwards.

Imagine the little defunct stretched on a table: the flaccidity of its soft parts is then so very striking, that the head becomes flattened under the influence of its own weight, whatever position may be given to it; the soft parts on the thorax exhibit the form of the ribs; the front of the chest is very much flattened, the abdomen sunken and nearly hollow about the navel, and forming two large rounded projections on the flanks; even the extremities exhibit the same state of collapse. The discoloration of the skin is particularly remarkable, although often confined to the abdomen, at least when the sojourn of the fœtus in the womb has not been very long. The skin of this part has a brownish-red shade, without the least appearance of a greenish hue. This tint is less marked on the chest, neck, head, and limbs; nevertheless, it exists there also. But this is not the brownish hue that often succeeds a green putrefaction; it is a much clearer reddish-brown. The cord is no longer twisted, but it forms a true fleshy cylinder, of a reddish color, soft, and saturated with a brown fluid. The epidermis is detached from a considerable part of the surface, and may be easily separated from those places where it is still adherent, thus leaving the humid dermis exposed, which is as glutinous as if it were lubricated by a mucous fluid; and then the true skin has a bright rose color. The epidermis on the feet and hands is white and thick, and looks as if it had been corrugated by cataplasms. The subcutaneous cellular tissue is infiltrated with a reddish serosity which is also seen between the muscles, and sometimes in the substance of the muscular tissue itself. The bones of the head are feebly held together, their periosteum may be readily detached, and they are movable on each other. The cellular tissue underneath the hairy scalp is infiltrated with a thick serosity, resembling currant-jelly in appearance. Finally, whenever we attempt to move or raise the fœtus, it slips through the hands just like a fish that lives for some time out of water, in consequence of the fluid mucus covering its surface. (Devergie, *Méd. Legale.*)

A dead fœtus is merely a foreign body in the uterus, which will soon have to be discharged. The time at which the expulsion will take place varies greatly; sometimes after a few days only, sometimes weeks will elapse, and occasionally a month or more. The symptoms which arise will be those of abortion or labor, according to the age of the fœtus at the time of its death.

CHAPTER XIII.

OF ABORTION.

The term *abortion* has been applied to the expulsion of the fœtus from the womb, where this occurs at a period of pregnancy when the product of conception is not yet viable: that is to say, an abortion may take place at any time between the commencement of pregnancy and the end of the sixth month. The ancients applied the term *effluxio* to this accident, if it happened before the seventh day.*

In a recent and very remarkable article by M. Guillemot, this author admits three varieties of abortion, founded on the period of its occurrence: thus, *ovular* abortion is the title he gives when it takes place before the twentieth day; *embryonic*, if prior to the third month; and *fœtal*, from the latter date up to the sixth month of gestation.

Persons out of the profession, further, designate abortion under the title of miscarriage (*fausse couche*).

Abortions are much more frequent in the first two or three months than at any other period. The great vascularity of the uterine mucous membrane, become the decidua, and the ease with which effusions of blood may take place into the space which originally exists between the chorion and the reflected portion of the decidua, sufficiently explain the frequency of hemorrhage, and consequently of abortion in the early months. In making this remark, I am not ignorant that Madame Lachapelle has given a different view, but it was because her position at the Maternity rarely furnished her with opportunities of observing abortions prior to the fourth or fifth month, for females do not usually go to the hospitals on account of the miscarriages of the first five or six weeks of gestation; and though other persons have since adopted her opinion, it is doubtless owing to the difficulty of diagnosis, and to the errors of females themselves, who, supposing they have only a simple retardation of the menses, allow an abortion to pass away in the early stages unperceived.

Morgagni and Desormeaux supposed that abortion of fœtuses belonging to the female sex are more numerous than of males, and I do not know whether the vulgar opinion opposed to this is true or false; but certain it is, that at term the boys exceed the girls in the proportion of sixteen to fifteen, which would seem to prove that female abortions are the most numerous; and besides, it is possible that the difficulty of distinguishing the sex in the earlier periods of intra-uterine life may have had some influence in creating the popular error.

The history of abortion evidently includes the study of the causes producing it, the symptoms and consequences which may arise, the signs by which it may be detected, and the more suitable indications for preventing or opposing it.

ARTICLE I.

CAUSES.

Considered in relation to its determining causes, abortion may be divided into the *spontaneous* and *accidental*.

* We place the period of viability at the *seventh* month, though well aware that some cases have been reported where fœtuses born at six, or five, or even four months, have lived; but such instances, besides not having all the authenticity desirable, are too rare to invalidate the general law.

The term *provoked* has also been used, where the abortion has resulted either from criminal efforts, or from the measures adopted by the scientific physician with a laudable object. We shall retain this division for etiological purposes.

§ 1. Causes of Spontaneous Abortion.

[The causes of spontaneous abortion may be sought for either: 1. In the father. 2. In the general health and habits of the mother. 3. In the state of the womb and its appendages. 4. In diseases of the ovum. 5. In diseases of the fœtus.

1. *Causes due to the Father.*—At first thought, says M. Ferdut, considering the transitory part taken by the father, it would not seem probable that he could be the cause of a miscarriage which should not take place until after two or three months. Such, however, is the fact, as is proven by the experience of women who invariably miscarried during the life of a first husband, but who were several times delivered safely at term after a second marriage.

The influence of the father in causing abortion may be exerted in two ways—by his constitution and by his diseases. Ova, fecundated by men who are either too old or too young, rarely become, it is said, fully developed, and the same remark applies to those whose constitution is exhausted by debauchery or excesses of any kind. From M. Devillier's article in the new *Dictionary*, it would seem, however, that he thinks the idea of an influence exerted by the father in the causation of abortion should be received with considerable reserve. We would remark, says this author, that the procreative power is entirely distinct from that of development. If a man, under the conditions mentioned, has been able to fecundate a robust and healthy woman, the generative influence once having been communicated by him, the development of the product of conception would thenceforth be almost wholly under the influence of the vitality of the woman; so that it is probable that the influence of the father would at least be very limited. (Devilliers.) It will also be understood that diseases of the father may, to a certain extent, be transmitted to the fœtus and produce abortion. Of all these morbid conditions, syphilis exerts a more deleterious influence upon the duration of pregnancy than any other, though, it should be stated, all authors do not agree upon the subject. We believe, at any rate, that we would be correct in saying that, in some cases, the father, and not the mother, ought to be subjected to a prophylactic treatment.]

2. *General Condition of the Mother.*—Women of a plethoric habit, and having copious menstrual discharges, are greatly exposed to abortion during the early months of gestation; in fact, we have already alluded to those hemorrhagic molimens that appear in them at every monthly period. Again, nervous, or very irritable women, those who are strongly affected by moral impressions, such as anger, chagrin, etc.; females of a sedentary habit, who are always shut up in the shops, as well as those that follow an indolent life, passing their time at balls or soirées, and in light reading, also abort very frequently. The surrounding atmospheric conditions are not wholly without influence in the production of abortion; in fact, we may refer to this cause those epidemic miscarriages spoken of by most authors. Mountainous countries, where the air is bleak, are considered as being favorable to their

production; for, according to the report of Saucerotte, the women inhabiting the summit of the Vosges are very subject to abortion, and they are in the constant habit of descending into the adjacent plains to avoid this accident.

Acute diseases, especially the eruptive fevers, and small-pox most particularly, occurring in the course of pregnancy, abdominal or thoracic affections, and recent cutaneous diseases, often give rise to miscarriage. Syphilis in the mother has the most disastrous influence upon the progress of gestation, and even the mercurial treatment does not always secure from abortion. Some writers think that the administration of mercury endangers the life of the fœtus. Their opinion is, however, rejected by most modern writers upon syphilis, almost all of whom regard the antivenereal treatment begun at the outset of pregnancy as the best means of preventing abortion. The numerous facts which have come under our own observation have changed our opinion upon this point, and we now think it most prudent to begin the treatment as soon as possible.

It often happens, indeed, that, notwithstanding the existence of constitutional syphilis, when the mother has been treated properly and sufficiently long, the pregnancy continues to the full period, and the child escapes the infection to which it seemed fated. (Duval.)

According to the author just quoted, it would seem that much depends upon the length of time which the disease has lasted. "Numerous observations," he says, "show that syphilis at its commencement does not usually endanger the product of conception, but that, at a more advanced period, it involves the greatest peril." It should also be remembered that Dr. Paul's researches have shown that lead-poisoning may likewise produce abortion.

The convulsive diseases may occasion miscarriage either by provoking uterine contractions, or by directly destroying the child.

3. *Diseases of the Womb and its Appendages.*—The causes dependent on the uterus are referable either to a particular state of that organ, or to a peculiar habit of the body, the influence of which is reflected back on the womb. The following are given as causes of abortion dependent on this source: An excessive rigidity of the uterine fibres, and their consequent resistance to dilatation; an unusual contractility and sensibility of the organ, and too great a laxity and weakness in the uterine neck. I willingly admit that, in certain females, the excessive sensibility of the uterine fibre will scarcely support, without reaction, the strange modifications it must undergo during gestation; but I do not equally comprehend that species of opposition, which some authors seem desirous of establishing, between the resistance on the part of the uterine walls and the expansive force of the ovum. What, indeed, can an ovule, a few lines in diameter, effect against the thick walls of the womb? or, what action can it possibly have on the uterine neck, that will explain the influence which has been accorded to this pretended laxity of the cervix, on the frequency of abortions? The truth is, the ovum and the uterus are developed simultaneously, but by forces peculiar to each. Therefore, although abortions are more frequent in primiparæ, where the females have been married too young or too old; and although certain women abort in all their pregnancies at nearly the same period, we must not on that account attribute these accidents to too great a resistance of the body, or to an extreme laxity of the neck; for these repeated miscarriages, when not owing to the hemorrhagic tendency before alluded to, are far more naturally explained by the excessive irritability of the womb. The organ has to habituate itself, as it were, to its new functions; a proof of which is, that, in many females, the accident is repeated a number of times, but each time at a more advanced period; so that, about the fourth or fifth pregnancy, they go on till full term. Hence, those uterine congestions, which are so often produced in plethoric women by the menstrual periodicity, and that excess of sensibility as well as of irritability observed in nervous females, are the only two predisposing causes that I consider as belonging to the uterus proper, and even they are mere exaggerations, as will be seen, of the physiological condition. Where abortions are often produced by the influence of either of these, they are designated as *periodical.*

But, independently of these two causes, we must evidently take into account all the diseases of the uterus, whether acute or chronic, whose action is discernible: thus, the various tumors which may grow in the substance of its walls, or may contract adhesions with them and the foreign bodies developed in its cavity, also ulcerations, whether syphilitic or otherwise, which are so frequently found upon the cervix, are so many predisposing causes, which may both hinder and oppose its free enlargement; and, lastly, let us add the various displacements of the uterus, such as prolapsus, lateral obliquities, or anteversion and retroversion, as acting in the same manner.

On the part of the appendages, all the chronic diseases to which they are subject; the adhesions, deformities, displacements, and their divers degenerations; the organic alterations of the tubes, fibrous, polypous, or other productions seated in the uterine tissue or neighboring parts; unnatural adhesions of the broad or the round ligaments, tubes, or ovaries: in a word, everything that can impede the easy and free development of the womb, must be regarded as occasional causes of abortion. (Madame Boivin, *Recherches sur une cause peu connue d'avortement.*)

Finally, an inflammation of the adjacent organs, particularly the bladder, rectum, etc., may, through the irritation thereby communicated to the uterus, bring on its contractions. Moreover, the existence of any voluminous tumor in the abdomen must necessarily incommode the development of this organ; also the compression of the hypogastrium, that some women produce by the use of corsets, may have the same effect.

According to Peu, we must add to these various sources of inconvenience, contraction of the pelvis opposing the distension of the womb, and sometimes its elevation above the superior strait; more especially when the narrowness of the latter coincides with the regular, or even an increased size of the excavation.

4. *Diseases of the Ovum.*—Any of the diseases of the ovum may give rise to abortion, and we shall not repeat what we have said concerning them. It will suffice to mention here that the most important of these diseases are, dropsy of the amnion, hydrorrhœa, the hydatiform mole, placental apoplexy, and fibro-fatty degeneration of the placenta.

As regards the insertion of the placenta over the neck, I can scarcely believe that it could produce an abortion, and hence I imagine that the cases cited in support of that view have been misinterpreted; the insertion has been considered as the cause of the accident in those instances, when it certainly was nothing more than a simple coincidence. M. D'Outrepont has advanced the torsion of the umbilical cord as a cause of determining the death of the fœtus; for the state of compression, says he, resulting therefrom, may impede the circulation. The embryos had been dead for a long time, in all the cases of that kind observed by him.

Again, it may be asked, if the umbilical cord is too short, could it drag off or detach the placenta, or even be ruptured itself? Now, to the facts bearing on this point, reported by Mauriceau, Stein, etc., M. Guillemot adds the following: The fœtus was about three months old, the umbilical cord was tightly stretched and even half separated near its origin at the navel; two folds of it encircled the neck, and some deep marks were left on this part from their pressure. The circulation, he continues, was therefore interrupted in the cord by the tension and compression it sustained; and the strangling of the child's neck also contributed to its death. M. Deneux has furnished a case of a rupture of the umbilical vein, and effusion of its blood into the tissue of the cord itself; he found there a clot, equalling a small nut in volume, which had interrupted the circulation in the umbilical vessels by its pressure.

Lastly, the disease of the membranes, and of the umbilical vesicle, also prove a frequent cause of abortion, especially in the early stages of embryonic life; for in more than two hundred products of conception, that had not passed beyond the third month, M. Velpeau generally found an alteration of some part of the ovum.

5. *Diseases and Death of the Fœtus.*—Circumstances, which are often unknown to us, may arrest the development of the fœtus: for instance, it may be affected in the mother's body, by those acute diseases which at times beset it after birth; and such affections, though not always fatal to the new-born infant, are the most disastrous to the intra-uterine fœtus as they occur the nearer to the period of fecundation. We may add, the presence of several children as a cause dependent on the child; in fact, we have elsewhere seen that the excessive distension produced by a twin pregnancy frequently brings on premature contractions. However, the uterus is rarely developed enough prior to the sixth month to provoke such an accident, for this seldom happens until a more advanced stage, and then it no longer appertains to abortion properly so called.

Some diseases of the parents may affect the child; for example, a vitiated spermatic fluid communicates to the new being a principle which does not fail sooner or later to destroy it. M. Guillemot attributed the numerous miscarriages of a young lady who consulted him to this cause; for her husband, although of a suitable age, exhibited all the characters of premature decrepitude. Having become a widow, she remarried, was several times pregnant, and was always delivered happily at full term.

The mother, also, may transmit her diseases to the child. Nothing, indeed, is more common than to find children presenting, a few weeks after birth, evident traces of the venereal infection received from the mother during intra-uterine life, and hence we may conceive that this hereditary taint may prove fatal to the fœtus whilst still within the womb.

Small-pox is also sometimes communicated from the mother to the fœtus and causes its death. It is remarkable that several circumstances seem to prove that the infection frequently does not take place until after the mother's recovery.

In some cases the body of the mother is but the conductor of a contagious principle of small-pox. We might here add examples in addition to those already cited.

Some years ago a woman in the wards of Professor Fouquier was delivered of a dead child affected with small-pox, although she had herself been vaccinated. Finally, the illustrious Mauriceau relates that his mother, when in the last stage of her pregnancy, had the misfortune to lose the eldest of her three sons by small-pox, to whom, notwithstanding her condition, she was unceasing in her attentions; and that at his birth, which occurred the day after the death of his eldest brother, he presented four or five pustules of small-pox.

In short, all the diseases to which the fœtus is subject may be followed by abortion. Its death always produces it.

§ 2. Causes of Accidental Abortion.

Besides the causes just enumerated that have been designated by most writers as the *predisposing* ones, but which, perhaps, would be more appropriately called *slow-acting causes*, there are yet some others that might be termed *accidental* causes: such as those which operate from without, and make their influence more promptly felt. The latter are very numerous; indeed, on reading the published cases, we find that authors have considered all the moral and physical excitements that women are subject to as so many causes of abortion. In most of the recorded instances we can readily satisfy ourselves that the observers have attached too much importance to these occasional causes of its production; for, generally speaking, it would have occurred without them, only, perhaps, a little later; and even here the expulsion of the fœtus is, in truth, owing to the slow and gradual action of the predisposing cause. However, there are some accidental causes whose influence is indisputable. For instance, falls, excessive fatigue, too frequent coition, and severe contusions, have, in some instances, produced immediately a loss of blood, followed by abortion.

Falls and contusions may act in two ways: either by bruising or violently irritating the mother's organs, or by wounding the fœtus and determining its death. The latter has been denied by some persons; but to the instances now known to science, I will add the following from my own observation: A young woman, six months pregnant, struck her abdomen violently against a table while walking in the dark in her chamber; during the night the motions of the child were for a time quite tumultuous, then they diminished, and on the following morning could not be perceived at all. Two days afterwards she was delivered of a dead child, which presented an ecchymosis on its back as large as the palm of my hand.

Burdach speaks of a woman who received a blow upon the lower part of the abdomen, when in the sixth month of her pregnancy, and who was delivered of a child, the bones of one of whose legs and of a forearm had been fractured, and united at an acute angle. The jarring attendant upon travelling by rail, or too great use of a sewing-machine, are also capable of giving rise to abortion.

I shall not enumerate here the various circumstances that have been considered as occasional causes; but, by way of showing how their importance has been overrated, I will merely remark that, although certain women, who are constitutionally predisposed to miscarriages, may abort in consequence of a trifling fright, or the odor of a badly snuffed candle, yet there are others, on the contrary, who will suffer the most acute moral impressions, and the most violent physical shocks, without any accident whatever resulting therefrom; and nothing would be more easy than to bring forward numbers of cases in support of this proposition; the following, however, may be sufficient: I had an opportunity of observing at the Hôtel Dieu, when acting as an "interne" in the obstetrical wards, a young girl in the fifth month of pregnancy, who, being rendered desperate by the desertion of her lover, cast herself into the Seine from the Pont Neuf, yet, notwithstanding so violent a shock, the gestation pursued its regular course. Again, M. Gendrin speaks of a young lady who was thrown from a chaise over the horse's head by the animal falling in his career. This lady was then five months pregnant, but the accident did not prevent her from reaching her full term. I met with a case precisely similar in the wife of a notary living near Paris.

I was consulted, in September, 1845, by a young lady, who was evidently six or seven months advanced. Her physician had suspected an inflammatory engorgement of the womb, and during the third or the fourth month this gentleman had applied fifteen leeches on the neck of the uterus itself; and, strange to say, not only was this application unattended by any accident, but the patient seemed relieved of the distress and pain in the hypogastrium. And, lastly, is it necessary to refer here to all the manipulations, and all the violent remedies, that some distracted women make use of in vain to procure an abortion?

§ 3. Causes on Account of which Abortion is Artificially Produced.

The third order of cases still remaining for our examination are the means of producing abortion. These must be distinguished according to the proposed object: that is, whether, in producing an abortion, the indication be to relieve the woman as well as the infant, if the latter is well developed, from the dangers that threaten them (and we shall treat of the means to be employed in such cases when we speak of the indications presented by the mother's vices of conformation), or whether, contrary to all the laws of morality, the design is to destroy the fœtus in the body of its mother, for the sole purpose of concealing the traces of an illegitimate pregnancy. But we have nothing whatever to say concerning the measures resorted to by criminal hands in such cases, for, unfortunately, they are too well known.

ARTICLE II.

SYMPTOMS OF ABORTION.

The signs of abortion vary with the period of its occurrence, and also with its determining cause. Thus, when it happens in the early days of gestation, it is attended by but very few remarkable phenomena; and, in general, the pain is so trifling that the patient scarcely suffers more than from a difficult menstruation. The first uterine contractions are sufficient to produce the complete separa-

tion of the ovum, the adhesions of which are still very feeble; and it escapes either in mass or in shreds, usually surrounded by fluid or half-coagulated blood, and, being mistaken for a clot, it often passes away unnoticed, most women then supposing that they have only had a slight postponement of their menses, followed by a more difficult and abundant flow than usual.

At a more advanced stage the symptoms are much better marked, but still vary with the cause of the abortion. For instance, when this accident has been produced under the influence of bad health in the mother, or of chronic diseases, or those causes that operate slowly, by altering the genital organs, or the ovum and its membranes, the following symptoms are ordinarily observed, namely: shiverings succeeded by heat, anorexia, nausea, thirst, spontaneous lassitude, palpitations, cold extremities, pallor, sadness, depression of spirits, tumefaction and lividity of the eyelids, want of brilliancy in the eyes, a sense of sinking at the epigastrium, of cold about the pubis, of weight near the anus and vulva, pain in the loins, vesical tenesmus, frequent ineffectual desires to urinate, and a weakness and flaccidity of the breasts, from which a serous fluid sometimes exudes. These phenomena may be considered as the precursors of an abortion; for, when they have lasted for some time, the pains in the loins become more and more acute, extend round to the hypogastrium, and are renewed at short intervals, finally assuming all the characteristics of the regular uterine contractions. During these pains, if the uterus is sufficiently high up to be easily distinguished above the pubis, it will be felt to harden sensibly, whilst at the same time a sanious discharge takes place from the vagina, afterwards becoming sanguinolent, and eventually replaced by liquid or grumous blood. If the woman be then examined per vaginam, the neck will be found partly dilated, the dilatation advancing progressively with the frequency of the pains; the membranes begin to protrude, then engage, and ultimately rupture; the waters escape, and the fœtus and placenta are successively expelled. Usually in those cases in which the cause has operated slowly, whether dependent on diseases of the mother or affections of the ovum, the fœtus dies before the labor, or at least during the first pains.

When the abortion is a consequence of the occasional violent causes, it usually has quite another course. Thus, in some instances, the expulsion of the ovum closely follows the accident; a woman slips in descending a staircase, and falls violently on her seat; when she rises, her clothes are flooded with blood, for an ovum of six weeks has been driven out, together with a large quantity of fluid blood. This, however, is more apt to occur in the beginning of pregnancy; for, at a more advanced period, some interval always elapses between the accident and the consequent abortion. The phenomena then observed vary, according to whether the cause has affected the mother's organs, or has directly influenced the fœtus itself.

In the former case, the mother experiences, at the time of the accident, a sharp pain, either about the loins, or else in some part of the abdomen; after the lapse of a few days, during which the pain has diminished, or even entirely ceased, it is violently renewed, and followed almost immediately by uterine pains and contractions, a slight dilatation of the neck, some discharges of serosity from the vagina, at first reddish, then sanguinolent, and lastly pure blood.

Finally, if the travail continue, the fœtus is expelled as usual, and often living.

The expulsion is almost always effected very slowly, and the progress of the labor is far from being as regular as at term. The resistance occasioned by the length and hardness of the cervix at this period sufficiently explain the extreme slowness of its dilatation; and even when the latter is sufficient, the contractile powers of the uterus are yet so feeble that the ovum may remain engaged in the orifice for several days, and even project into the upper part of the vagina, before being expelled completely.

When the cause has acted directly upon the fœtus, either mechanically, as by a violent blow or concussion, or physiologically, by destroying to a greater or less extent its vascular connections with the uterus, the subsequent course of affairs is different; for here the phenomena which announce the death of the product of conception are the first to be manifested. After the few hours necessary to dissipate the agitation and fears caused by the commotion she has experienced, the woman feels no pain nor inconvenience; everything is calm, and seems to resume its natural order; but, after the lapse of a few days, sometimes only eight or ten, the movements of the fœtus, which had up to this time maintained their usual force and frequency, become weaker, are separated by longer intervals, and finally become imperceptible. From this moment, the uncomfortable sensations and digestive disorders, which had annoyed the patient from the outset of pregnancy, disappear as though by magic; the swelling of the breasts and prickling sensations which had affected them, also diminish or cease entirely. A miscarriage is then inevitable, for the ovum is a foreign body in the uterine cavity, and soon irritates the walls of the organ by its presence; the latter contracts, and the expulsion is generally effected about eight to nine days after the accident. In this case, the process advances in a more regular manner, because the womb has had time to prepare itself for the act. However, this term is not uniform, it being not at all uncommon for the dead fœtus to remain much longer in the womb: two or three weeks, or a month, for example. I saw a woman at the Clinique, in whom the child's death was clearly ascertained, though she did not abort until six weeks afterwards. Cases are also recorded of the embryo remaining in the womb until the ninth month.

The development of the contractions is solicited by the derangement which this condition of death gradually produces in the placental circulation; indeed, the quantity of blood arriving in the placenta often diminishes by degrees, and ultimately becomes almost nul; but this is not always the case, since, in some instances, the circulation continues, and the placenta enlarges—attains even to double the volume of that at term, and after its expulsion exhibits the same degree of integrity. Lastly, in other cases, says M. Guillemot, the placenta retains its vitality and grows; but, at the same time, assumes unusual forms, and a singular structure, exhibiting a cavity in which remains of the fœtus are hardly to be found.

Where a long time thus ensues between the period of the child's death and that of its expulsion, there is, in general, less danger from hemorrhage than if the premature labor had taken place immediately. In these abortions, less blood is usually lost than in the labors which come on naturally, after the most favorable gestations; which is probably owing to the fact that the child's death diminishes the activity of the uterine circulation, especially that of the utero-placental vessels, which must then become obliterated in a great measure, and consequently can furnish but little blood at the time when the placenta is separated.

We have seen that the general phenomena experienced by the mother after the death of the fœtus are very singular in these cases, but abortion does not always follow immediately, a variable interval, sometimes a long one, intervening before labor begins. The child born under these circumstances has a peculiar macerated appearance, but no evidence of putrefaction.

But it happens otherwise when, the fœtus being dead, the membranes are ruptured, and the expulsion is delayed; for then a rapid putrefaction sets in, as a consequence of the contact of the child with the external air. A high fever, characterized by the symptoms of a veritable infection, develops itself; a dark fetid liquid oozes from the genital parts, mixed with shreds, in a state of putrefaction; and if the uterine contractions do not speedily relieve the organism from this source of infection, the patient may rapidly succumb under its deleterious influence. Finally, when the abortion is brought on by the existence of two children, the twins are nearly always expelled simultaneously; although we have occasionally known the women to abort of one child in a multiple pregnancy, whilst the other continued to grow.

Hemorrhage is one of the most common symptoms. It may

precede, accompany, or follow the expulsion of the fœtus, and is of such frequent occurrence that most authors make it the principal disorder. In some cases it is certainly the cause of the abortion, though often merely a consequence. Sometimes, indeed, the miscarriage is accompanied with but slight hemorrhage. The latter circumstance is, however, rare, especially in the false labors that take place before the end of the fourth month; because a more or less abundant discharge of blood nearly always shows itself during the first expulsive pains, and persists until the uterus is completely emptied; but, as we all know, nothing of this kind is observed in labor at term. M. Jacquemier has happily explained the difference between the two in the following manner: He states that, towards the end of gestation, the placenta spreads out from the centre towards the circumference, in order to conform itself to the uterine enlargement at its greater extent; and this is accomplished in such a way that its different lobes, by separating from one another, have a considerable space left between them.* From this it follows, that, within certain limits, the uterine contractions have no tendency to detach it; for the placenta accommodates itself wonderfully to the retraction of the organ until it reaches its own proper limits; and even then its great flexibility permits a further reduction, so as to follow the uterus as it becomes less, before the detachment commences, and this latter phenomenon only takes place when the entire fœtus is nearly expelled. But, prior to the fourth month, the after-birth is far from offering the same conditions; since the thickness of the utero-placental decidua and the large amount of plastic matter interposed between the lobes at that time, confer upon it a much greater density; and therefore it can only yield within very narrow limits, either in the way of extension or retraction towards its centre. Hence, the facility of its separation during the early contractions, the rupture of a certain number of vessels, and the incessant hemorrhage throughout the whole duration of the labor.

ARTICLE III.

DIAGNOSIS.

Judging from the numerous signs just given, the diagnosis of an abortion ought to be very easy; but, unfortunately, these signs are not very clearly marked until the accident is inevitable, and consequently, when it is a matter of indifference to the patient whether the physician makes out a clear diagnosis or not.

It is, therefore, in the beginning of such symptoms, especially, that we should endeavor to recognize their true nature, because then only can our art succeed in arresting their progress; but this is exceedingly difficult.

The diagnosis of abortion involves the solution of several questions. Is the woman pregnant? And, supposing the pregnancy to be determined, are the symptoms those of a simple uterine congestion, or of a commencing abortion? Lastly, is the abortion inevitable?

1. *Is the Woman Pregnant?*—This first question is quite readily resolved after the fourth month of gestation, though before that period it is almost always unanswerable. All practitioners of obstetrical experience are aware of the difficulties which often involve it. Thus, a woman in good health has her courses suddenly suppressed for several months without any appreciable cause, the breasts swell, and the body increases in size: in a word, she experiences several of the phenomena properly regarded as rational signs of pregnancy; then, all at once, at the return of the third or fourth menstrual period, some symptoms of congestion of the uterus appear, last for several days, and are soon followed by a slight flow of blood. How, then, shall we determine whether the pains felt by the patient, and the discharge of blood from the vulva, are owing to a return of the interrupted menses, or to an approaching abortion? The pains attendant on difficult menstruation, especially after a suspension of several months, resemble greatly, both in situation and intermittence, those of abortion. According to Madame Lachapelle, in abortion the uterine orifice is open, the hemorrhage precedes the pains, and the latter persist notwithstanding the abundance of the discharge; whilst in difficult menstruation the orifice is closed, the pains are felt before the hemorrhage appears, and they diminish or even cease entirely when the discharge is well established. The contrary, however, not unfrequently occurs.

Doubtless a strict investigation of the circumstances which accompanied and followed the suppression of the menses, and an examination of the uterus, might lead to an opinion as to the probable state of the case; but what experienced physician does not know how deceptive are all these rational signs, when we take into consideration the tendency to exaggerations of the females, who so readily believe what they wish or what they fear, as also how nearly the congestion, which precedes and accompanies the suspended menstruation, places the uterus in the same physical conditions as in a commencing pregnancy?

Does the blood escape from the genital parts as a clot? It has been hoped that the shape of the latter might furnish a reliable sign.

It has been stated that the clot driven from the unimpregnated womb exhibits a triangular form, corresponding to that of the cavity where the blood coagulated, which never happens when a product of conception is present; but this may fail, as the clot is mostly changed in its shape by traversing the neck; and, on the other hand, in abortion, the blood may collect and coagulate in the vagina, and the coagulum exhibit the indicated character.

But, if the coagulum be still in the cervix uteri, and supposing the finger is able to reach this point, how can we distinguish whether the foreign body felt there is a clot or ovum? For this purpose, Holl has laid down the following signs: If the finger introduced into the orifice perceives the mass to become tense during the contraction, to augment in volume and advance towards the vulva, it is an ovum engaged in the os uteri; and if it were a clot, it might be recognized by its fibrinous structure; besides, during the pain, its exterior surface would not be more tense, nor more smooth, and it would not appear forced down, but rather compressed; finally, as the ovum resembles a soft bladder, its inferior extremity is rather rounded than pointed, while the coagulated mass is more resistant and solid, is less compressible, and has, in general, the form of a cone, the enlarged extremity of which is above and the apex below.

Finally, if we should then attempt to move the uterus in its totality by pressing on this mass, it might be easily effected if there were a clot concerned, whilst the parietes of the ovum would yield, and would not transmit the motion to the organ which envelops it, and with which it is then but feebly adherent.

The question is therefore by no means simple, yet it is important to know whether pregnancy really exists; for as the appearance of the menses is then of very rare occurrence, especially when they are absent in the early months, a flow of blood should be treated as a serious accident, which, on the contrary, would be promoted, if attributable to a return of the courses. Notwithstanding these uncertainties, there may be a union of circumstances such as to allow of at least a probable diagnosis. Thus, if a woman, who has been habitually regular, finds her catamenia to stop suddenly and unaccountably; if this suppression is followed by other rational signs of pregnancy; if the pains continue notwithstanding the discharge of blood; if they appear as an effect of any violence whatsoever, or if they present anything unusual as respects either intensity or duration, it may be concluded that abortion is imminent. The diagnosis becomes more certain if the blood flows more profusely than in ordinary menstruation, if it is accompanied with sharper pains in the hypogastrium than is usual, if coagula are expelled, and if the orifice is sufficiently dilated to admit the extremity of the finger.

* To convince one's self of the truth of this fact, it is only necessary to see the placenta still adherent to a uterus which has been developed but is not yet retracted, or even the uterine surface this mass occupied; for the latter is nearly one-third larger than the surface of the placenta which covered it. (*Jacquemier.*)

2. Pregnancy existing, may the symptoms be attributed to simple congestion of the uterus, or should they be regarded as the first tokens of a threatened abortion? Though it is very difficult to decide this question within the first three or four months, and at the beginning of the accident, its solution is happily of little importance as regards the treatment, the measures indicated by simple congestion being equally applicable to the prevention of miscarriage.

When symptoms, which in all appearance were due to simple congestion, have yielded to proper treatment, the physician is often required to answer a question whose rigorous solution is always impossible: namely, the abdominal and lumbar pains being allayed, and all the other alarming symptoms removed, is the patient therefore out of danger of miscarriage? In the majority of cases we can tell nothing about it, for it is impossible to know whether the congestion has been arrested in time to prevent a rupture of blood-vessels, and an effusion between the placenta and uterus, or whether the separation of the placenta is extensive enough to have destroyed the fœtus immediately; even supposing the child to be still living, we cannot ascertain the degree of separation of the placenta, nor foresee the effect which a partial destruction of its maternal attachments may have upon the fœtus. Very frequently, indeed, the latter, by being cut off from a considerable part of its means of respiration, is placed in the condition of an adult whose lungs are in great measure destroyed, and whose respiration and nutrition being insufficient, gradually wastes away, so the child often does not perish until after the lapse of eight days, two weeks, and frequently even not until the next menstrual period; this, too, without the appearance of any new symptoms to explain its unlooked for death. The physician cannot therefore be too reserved in his diagnosis, as regards the possible consequences of such accidents.

3. Finally, supposing the abortion begun, can we hope to arrest the symptoms? The intensity of the pains, their constant direction from the umbilicus towards the coccyx, the previous duration of the discharge, and the amount of blood already lost, softening and dilatation of almost the entire neck, and even of the internal orifice, and projection of the membranes during the contraction, doubtless indicate a very unfavorable prognosis, though they should not destroy all hope. All these symptoms conjointly have in fact been known to yield to appropriate treatment, everything to resume the natural state, and the pregnancy to go on as usual. Some authors even state that the rupture of the membranes and discharge of the amniotic fluid does not render abortion inevitable. This last assertion, however, seems to me to be at least very contestable, for it is infinitely probable, not to say certain, that in the cases alluded to there has been a mistake in reference to the true origin of the waters lost by the patient. It appears to me that a rupture of the ovum must inevitably give rise to abortion; and Desormeaux has certainly confounded cases of hydrorrhœa with the true discharge of the amniotic fluid.

A young lady, who had already been so unfortunate as to miscarry in her first pregnancy, to be delivered of a dead child in the second, and finally to have lost a little girl of six months, had advanced three months and a half in a fourth pregnancy. After returning from mass, in a church very near her dwelling, there was a sudden discharge of fluid from the genital organs, to an amount estimated by the patient at about a tumblerful. On first seeing her, I thought abortion inevitable. Then, upon a careful examination of the uterus, it seemed to me, that, notwithstanding the loss which had occurred, the organ presented its usual size, a certain elasticity, a peculiar suppleness showing that some fluid must still remain within the amniotic cavity; there was nothing peculiar in the state of the cervix; no flow of blood; neither was there pain before, during, or after the discharge of water. In acquainting the patient with the fears which I entertained, I also assured her that all hope was not lost, and that the circumstances just mentioned presented collectively features which do not usually appertain to ruptures of the ovum itself. Absolute quiet, a small bleeding from the arm, opiate enemata, and hand-baths, to be repeated morning and evening, were directed. No new symptoms supervened, and the development of the uterus continued. For the first two days there was still a very small discharge of water. At four months and a half, also without appreciable cause, there was a sudden escape of five or six spoonfuls of a fluid similar to the preceding. After this, nothing of the kind occurred until the end of her pregnancy, which terminated very happily.

Abortion is really inevitable only when the fœtus has ceased to live, or when the separation of the placenta and the rupture of the utero-placental vessels are so extensive that the remaining utero-placental attachments are unequal to the support of the fœtal respiration.

In order to estimate the probable degree of disturbance of the utero-placental relations which has taken place, much more regard must be had to the amount of the discharge than to its duration. A simple exudation, or a moderate flow of blood, may continue for several days or weeks, since it may originate in the rupture of very few vessels; I have known it to last for six weeks and two months, without compromising the pregnancy; but that the patient should lose a considerable amount of fluid or coagulated blood in a short time, the placenta must be separated to a considerable extent, and abortion almost necessarily ensues.

There is still another peculiarity not mentioned by authors, which appears to me of importance, inasmuch as it cuts off almost all hope of arresting the progress of the symptoms: I allude to a particular form of the neck. When the patient has been for a short time only pregnant, we know that it is always easy to distinguish the neck of the uterus from its body; in the great majority of cases, we may even feel the angle which separates them. Now, when the contractions have lasted for a certain time, they have gradually dilated the internal orifice; the cavity of the neck has become confounded with that of the body, and when the finger in the vagina is passed over the entire lower segment of the uterus, the neck can no longer be distinguished from it; a well-defined limit between them is no more to be detected, and all that belongs to the neck of the womb has the shape of a pear, the larger part being continuous with the body of the organ, and the lower extremity corresponding with the external orifice. Whenever I have met with this condition of things, abortion has taken place. "The vagina itself," Dr. Coffin remarks, "is so far affected, that its upper extremity becomes rounded, the rugæ are effaced, and the finger meets everywhere a smooth and regular surface like that of a polished vase."

It is impossible to ascertain certainly in the early months whether the fœtus be living or dead. I must, however, mention a peculiarity which in my estimation is of great value in reference to this question: namely, the sudden cessation of the vomitings, salivation, or any other sympathetic functional disorder of pregnancy. When, after an accident, vomiting and salivation cease, there is cause to fear that the child is dead, the persistence of these discomforts being on the contrary a favorable sign. Happily, though the uncertainty upon this point makes an exact prognosis impossible, it in nowise affects the treatment. Whenever, indeed, a collective examination of the general and local symptoms leads to the supposition that the child is living, and that we may hope to arrest the progress of the accident, we should act as though we were certain.

We see, therefore, that in the first third of gestation the diagnosis, at the best, can be only probable.

At a more advanced stage of gestation, the diagnosis is much more certain. First, because we can then generally ascertain the development of the uterus without difficulty; then, again, pains are more energetic: the blood flows in greater abundance, and the dilatation of the os uteri is more easily detected; but it becomes still more certain when the death of the fœtus can be verified in a positive manner.

ARTICLE IV.

DELIVERY OF THE AFTER-BIRTH.

The spontaneous expulsion or the extraction of the placenta presents very different phenomena according to the period when the

abortion takes place; and, in this respect, it is highly important to distinguish the accident in the first two months from that of the third and fourth, as also from that of the fifth and sixth; for the ovum is usually expelled entire in the first and second months, but in the two latter the expulsion of the placenta is accomplished nearly in the same way as at term. But in the third and fourth months it is altogether different, because the placenta, which is already voluminous, has contracted at this period numerous and very intimate adhesions with the womb, which has not as yet acquired all the contractility of tissue that it possesses at term; consequently the premature contractions, although sufficiently energetic to rupture the ovum, are not adequate to the destruction of the utero-placental adhesions. Hence, under the influence of such contractions, the amniotic sac, being pressed on all sides, yields near the neck, the waters escape, the little fœtus is expelled, and the very delicate umbilical cord breaks easily; at the same time a certain quantity of liquid or coagulated blood is poured out, and very often the small fœtus is lost in the midst of the coagula that accompany its discharge. Then the uterus, being partially evacuated, retracts, the neck closes up and the symptoms disappear; nevertheless, the placenta and membranes are still undelivered, and may remain in the womb for eight, ten, or twelve days, or even longer. Dr. Advena, of Labischin, reports an instance where the after-birth was not expelled till three months subsequent to the abortion, this latter having occurred at the fifth month of pregnancy. (*Journal de Chirurgie*, Aug., 1843.)

The complete closure of the neck evidently makes the introduction of the finger impossible, so that every attempt made for this purpose would prove fruitless. Ergot may, indeed, be administered with the object of exciting contractions, though I have never seen it have any good effects when given under these circumstances. To wait, at the same time watching carefully, is all that can be done.

The symptoms which may then result from retention of the placenta are very variable, and should be carefully studied.

1. Very frequently, nothing at all unusual is observed for a few days following the miscarriage. The general health is good; the patient, believing herself entirely cured, gradually resumes her ordinary occupations, when all at once, and without any known cause, some intermittent pains are felt in the hypogastrium, and a little blood escapes from the vulva. The woman often neglects these primary symptoms, but they persist and augment in intensity, thereby constraining her attention to them; for the placenta has become a foreign body in the womb, and, irritating the uterine walls by its presence, excites their contractions; these break up the utero-placental adhesions, and the after-birth is almost free in the uterine cavity. This separation is always accompanied by hemorrhage, which is at times very abundant, because the os uteri dilates with so much difficulty, to permit the foreign body to escape, that the latter, by remaining in the womb, encourages a hemorrhage by irritating the organ and preventing the complete contraction of its walls; insomuch that, if art does not seasonably interpose, life itself may be endangered by the great amount of the discharge.

What is still worse, if the physician did not happen to be present at the time of the miscarriage, if he had not carefully examined all the clots himself, the attendants will not fail to tell him that the after-birth and the child were expelled together, and, should he pay any regard to their statements, he may possibly overlook the cause of the accident altogether. I have been summoned several times to such cases, and have invariably been told by the persons questioned that the placenta was delivered. Consequently, the accoucheur should rely exclusively on his own personal examination in such cases. He must absolutely touch the female, when he will usually find the os uteri to be partially dilated, and a portion of the placenta hanging in its orifice. It then is only necessary to seize this portion with the two fingers, for its extraction is, in general, quite easy. In case of necessity, Levret's abortion-forceps, Duges' placenta-crotchet, or Pajot's curette, might be used for this purpose.*

Sometimes the adhesions of the placenta are so numerous that it is impossible to destroy them and extract the latter, even with Levret's forceps. It is then possible, by strong pressure upon the hypogastrium, to depress the womb, so that the forefinger of the other hand can be passed into its cavity, and glided between the placenta and the uterine walls. Lastly, if this does not succeed, the tampon must be resorted to, and the ergot administered at once; for the conjoint use of these measures rarely fails to arrest the hemorrhage, and bring on a sufficient degree of contraction to expel the secundines.

Such are the measures which should be resorted to whenever the hemorrhage becomes dangerous either by its duration or abundance. When, however, it is arrested, especially when the placenta is partially engaged beneath the orifice, and seems to prevent, by its presence there, further discharge, we should wait, and be very careful how we attempt to extract it immediately. The engagement of the placenta in the cavity of the neck maintains in the latter a degree of dilatation likely to facilitate its complete expulsion, and besides exciting, as a foreign body, the sensibility of that part, also excites, or at least keeps up, the contractions of the fundus of the womb. Tractions upon the engaged portions might tear the placental mass at the point of constriction by the retracted internal orifice. Now, immediately after this partial extraction, the neck would resume its former condition, the internal orifice would close more or less completely, and render impossible the removal of the portion of placenta remaining in the cavity of the body of the uterus.

2. But matters do not always pass off so happily, and a retention of the placenta may give rise to the most serious accidents. In fact, it sometimes remains in the uterine cavity after having been separated wholly, or in part, and soon undergoes decomposition, just as though it were exposed to the air; the lochia become fetid; the uterine walls, being in contact with the substances in course of putrefaction, absorb a portion thereof, and, as a consequence, fever is developed, together with all the symptoms of a putrid infection. In these distressing cases we should evidently relieve the womb from those foul materials that infect the whole economy; but, unfortunately, the neck of the uterus is completely closed, and an introduction of the finger thereby rendered impossible. Often, indeed, it is exceedingly difficult to make the extremity of a canula enter for the purpose of throwing detergent injections into the uterine cavity, and we are then compelled to await the complete expulsion of the excessively fetid sanious matters resulting from the decomposition of the placenta. In such cases, M. Velpeau speaks favorably of the use of ergot. This, indeed, is a remedy that might be used, but from which we should not expect too much.

A lady, thirty-five years of age, whom I suspected to be pregnant, although she would not believe it, felt a discharge from the parts after a suspension of the menses for two months and a half, which she at first mistook for a return of her courses, but which, after riding out in a carriage, was suddenly converted into a profuse flooding. Having been summoned immediately, I found the os uteri slightly dilated, and I forthwith employed various measures adapted to the arrest of the discharge, and among others the ergot. The hemorrhage gradually diminished, and at ten o'clock P. M. (six hours subsequent to the invasion of the symptoms) it had entirely ceased. During the first five days the patient did very well, but on the sixth I thought I detected a slight odor in the

* This is a blunt hook, formed of a loop of iron or silver wire, of a line or more in diameter. The loop is narrow in proportion to the thickness which it is desired the hook should have, never, however, exceeding an inch and a half in width. It is curved near its extremity, so as to form a hook of the size required. The remainder of the loop, which serves as a handle, receives the curvature necessary to facilitate the introduction and use of the instrument. It is directed into the womb by a few fingers, when it receives the soft mass in its concavity, and is then slowly drawn out. (*Dict. Méd. et Chir.*, *en* 15 volumes.)

lochia, and at three o'clock in the afternoon a violent chill came on, which lasted an hour. From this moment all the phenomena of absorption were manifested. I immediately administered forty grains of the ergot, but without effect, for nothing came away; and notwithstanding the enlightened efforts of Messrs. Chomel and Moreau, who were several times called in consultation, this unfortunate lady died on the tenth day following the appearance of the first symptoms. At the *post-mortem* examination we found the uterine tissue softened, and its cavity filled by the putrefied and still adherent placenta, which we could not separate without tearing.

3. It may further happen that the placenta, maintaining its vascular adhesion with the internal surface of the organ, continues to be developed after the child's death, the cord and fœtus become atrophied, and then completely destroyed; or, indeed, the ovum may rupture, and the little product escape, leaving the membranes behind. These envelopes may undergo various modifications, but the most common is the morbid product known as a fleshy *mole*. It has been generally conceded, since the researches of M. Velpeau on the subject, that moles which are expelled from the uterine cavity are merely the remains of an altered product of conception.

4. Lastly, there is yet another mode of termination, admitted by Nægéle, Osiander, etc. I allude to the absorption of the placenta retained in the cavity of the womb; for although such an absorption has been observed even after delivery at term, yet most of the reported cases refer especially to miscarriages.

ARTICLE V.

PROGNOSIS.

The prognosis of abortion is necessarily variable, according to the time of its occurrence and the cause which has produced it. As regards the fœtus, it is always mortal, since the expulsion takes place before the product of conception is fitted for an extra-uterine life, though I am well aware that cases are reported of children, born prior to the period of viability fixed by law, which have lived; but these examples, even were they authentic, are too rare to invalidate the general proposition just laid down.

As regards the mother, the prognosis is said to be more grave than that of labor at term; but this proposition, which has been advocated since the days of Hippocrates, requires explanation, and should not be received without some restriction; for the prognosis, considered in relation to immediate consequences, is certainly less serious in a case of abortion than in a natural labor; but the remote effects are undoubtedly more disastrous in the former case. Thus, the acute diseases which attack lying-in women are more frequent after labor, whilst the chronic disorders of the genital organs which appear in advanced age are more common with females who have often aborted than with those who have always been delivered at term.* Again, it is highly important to notice the unfavorable influence that one abortion seems to have over subsequent pregnancies; for whenever a woman has had a miscarriage, she is more predisposed than others to a similar accident, and hence great precautions should always be taken to prevent it.

The period at which an abortion occurs also influences the prognosis, although we cannot exactly say, with Desormeaux, that it is more serious for the patient in the advanced stages of gestation. Doubtless, as before stated, it scarcely constitutes an indisposition in the first or even the second month; but in the third or fourth, the expulsion of the fœtus demands a certain dilatation of the os uteri, and tolerably energetic contractions; for the neck and body of the uterus have not as yet undergone the modifications necessary to such an effort, and the delivery of the after-birth often presents difficulties less frequently met with at a more advanced stage of gestation; whence I conclude, that an abortion is then more grave and painful to the patient, as also more dangerous, than in the fifth or the sixth month.

Lastly, the prognosis varies with the cause of the accident. Thus, the most serious of all is an abortion brought on either by medicines administered internally or by manipulations; while a miscarriage determined by slow and gradual influences is usually attended with less danger than one caused by external violence or some powerful moral commotion. In this latter case, the hemorrhage which precedes, accompanies, or follows the abortion, is nearly always much more serious. Lastly, when it occurs in the course of an acute inflammation of an important organ, or during the existence of an acute disease of the skin, it is exceedingly dangerous.

ARTICLE VI.

TREATMENT OF ABORTION.

The treatment of abortion consists in preventing it, in favoring the expulsion of the ovum when this is inevitable, and in remedying the various accidents that may complicate it.

1. *Preventive Measures.*—When the miscarriage is dependent on the woman's bad constitution, or on a lesion of the genital organs, we must endeavor to combat and destroy this pernicious predisposition, more especially in the intervals between the gestations. I shall say nothing at this time of the means of modifying the general vices of the constitution, since they necessarily vary with the nature of the affection. It is particularly important, however, to bear in mind the disastrous influence of syphilis, whether the father or the mother be infected with it, over the life of the fœtus; and we should persuade them to submit to a mercurial course.

When it happens that several abortions have resulted in consequence of some displacement of the uterus, the latter should be remedied by the appropriate measures; for instance, in the commencement of pregnancy, the woman should avoid all fatigue and every violent effort; and it is even advisable for her to remain in the recumbent position until the uterus rises above the superior strait.

We award the proper value to the influence attributed by Desormeaux to the supposed rigidity and excess of sensibility or contractility in the uterine fibre, as well as to the excessive weakness or relaxation in the fibres of the neck. But, whilst interpreting the action of those causes in a different manner, we believe, with him, that bathing, general bleeding, opiate injections, and a regulated course of living, are the means best suited to moderate this great irritability of the organ; and that a tonic and strengthening regimen, aided by the ferruginous preparations, cold baths, and the chalybeate mineral waters, will be the most usefully employed in those cases where the general debility of the patient may have seemed to exercise some influence over her former abortions.

Plethoric women, who usually have profuse menstrual discharges, and who may have previously suffered from abortion at the periods of menstruation, all of which had been preceded by the symptoms of general or local plethora, and all followed by more or less copious discharges, should be subjected before fecundation to a restricted regimen; and during gestation, they should avoid all moral and physical excitements, and should remain in bed eight, ten, or even twelve days at every monthly term; besides, they ought to be bled several times during the earlier periods of pregnancy, more especially just before the time for the menses to appear.†

These, more than other pregnant women, should renounce the

* Would it be unreasonable to suppose that, inasmuch as women who have had frequent miscarriages are particularly liable to chronic diseases, the tendency may be due to the fact that they have long borne the germ which occasioned their previous abortions? Which was the cause and which the effect? (Blot.)

† The physician often meets with much opposition from persons out of the profession when he proposes a preventive bleeding in the early stages of gestation. Particularly, should any accident happen shortly afterwards, they would not fail to reproach him with it. This, however, is no just reason for not acting according to his convictions, or for yielding in cases where he believes it really useful; now experience has fully proved that, in such instances as those we have described, it is one of the best preventive measures.

use of corsets, which, independently of the restraint they make on the development of the breasts, oppose the free return of blood, by interfering more or less with the abdominal and thoracic circulation, and thereby favor congestion of the inferior organs.

Feeble, cachectic females, who are impaired by former diseases, and those whose tissues are soft, and their circulation languid, or who, from being habitually irregular, are affected with chronic leucorrhœa, are often attacked by hemorrhages during pregnancy which ultimately lead to an abortion.

In such patients the face is pale, the pulse soft, small, and irritable, the tongue white, digestion painful, the intestines torpid, and the extremities cold. The least exercise fatigues them, sometimes even exhausts their strength. The fatigue is often accompanied by a sensation of weight, of painful draggings in the groins and lumbar regions, and, should they remain standing for any length of time, the uterus seems to require some support, as it appears just on the point of escaping by the vagina or rectum. Even in the earliest stages, they feel something like a weight in the lesser pelvis, always pressing on the most dependent part.

Now the best mode of preventing such a condition is to prescribe a tonic regimen, together with the ferruginous and bitter preparations. Canella, in powder, has been recommended; and Sauter highly extols the use of powdered savine; he asserts that he has succeeded in correcting this pernicious predisposition in pregnant women, who had previously had several miscarriages, by administering fifteen grains of the powder three times a day, continuing it for three or four months; by this remedy he has arrested flooding and prevented abortion, and many patients can attribute the fact of having children born at full term to the employment of this precious drug.

White, of Manchester, has particularly recommended cold bathing, especially sea-bathing, to be often repeated, both before and during pregnancy.

The accoucheur must therefore search in the history of former miscarriages for the indications to guide him in the use of preventive measures; and it is likewise very important that he should make himself acquainted with all the accompanying circumstances.

Pregnant women are very often constipated, and this constipation frequently becomes the cause of periodic abortions, by the irritation it produces; hence, it should be prevented by the use of some simple injections, with the addition of one or two tablespoonfuls of linseed-oil, regularly, every other day, for two weeks before the period when the abortion occurred last time, and they ought to be continued for two weeks after it.

But whatever may have been the predisposing cause whose influence was exerted in the previous pregnancies, there is one very important precaution, the neglect of which might render all others useless. In all cases where abortion has occurred several times, it is indispensable that the organ should remain undisturbed, and the husband be recommended to allow from six to eight months, or even a year, to elapse, without the wife being exposed to become pregnant.

When this accident has already occurred a number of times in former pregnancies, it is always indispensable for the woman to abstain altogether from intercourse with her husband, for all sources of irritation must evidently be withdrawn from the womb. Again, if the fœtus was expelled dead in the preceding gestations, and this death had been caused by some lesion of the ovum, it is almost impossible to recognize, and consequently to prevent, a similar alteration.

The case is rather different when the previous abortions have been attributed to utero-placental or intra-placental effusions, for these are almost always the result of a congestion of the uterus of sufficient intensity to produce a rupture of vessels. In another pregnancy it might be possible to avoid such accidents. We would, however, call attention to the fact, that these local congestions may occur in chlorotic as well as in plethoric women, and consequently, that, although revulsives applied to the upper part of the body, or to the superior extremities, are useful in all, bleedings from the arm at the menstrual periods are very advantageous with the latter, whilst the former are benefited by the preventive use of ferruginous preparations, administered from the commencement of gestation.

Under some unfortunate circumstances, nature seems to deride all the attempts of art, and abortion reoccurs. Still, we must not despair when the woman becomes again pregnant, for experience fully proves that, notwithstanding numerous former abortions, a fresh pregnancy has sometimes succeeded in reaching full term. Dr. Young relates in his lectures the history of an unfortunate lady, who, after having had thirteen successive abortions, became pregnant for the fourteenth time, and was happily delivered of a living infant at term.

But, notwithstanding all these precautions, it sometimes happens that an abortion is threatened. The patients are affected with shiverings from the most trifling causes, pains in the hypogastrium, loins, etc.; uterine contractions appear, the sexual parts become moist, and occasionally even the os uteri dilates; but even here we must not lose all hopes of arresting the accident, notwithstanding those symptoms.

If the patient is robust, the pulse full and frequent, more especially if the development of the symptoms had been preceded by indications of plethora, bleeding in the arm should be at once resorted to, the woman be laid as horizontally as possible, and opiates immediately administered. The laudanum of Sydenham may be given in the dose of twenty, forty, or even sixty drops, diffused in a small quantity of some mucilaginous liquid as an injection, and repeated at intervals of an hour, until the contractions disappear. This remedy, of which we have before spoken, is one of the most efficacious in cases of this kind, and sometimes it alone has enabled us to arrest a labor whose termination seemed to be inevitable, and thus has permitted the gestation to pursue its regular course.

I cannot refrain from citing the following instance in illustration. A woman, advanced to three months and a half, was taken with pains in the abdomen and loins, after a violent altercation with her husband; on the following day the pains augmented, and a little bloody fluid escaped from the genital organs; the pains still continuing, and the discharge having somewhat increased, on the third day the patient came on foot to the Clinique. I found on her arrival that the uterine contraction was very distinct, the pains sharp, and renewed every eight or ten minutes; pure blood was discharging from the vulva, and the orifice was sufficiently dilated *to permit the finger to pass readily as far up as the naked membranes.* I administered sixty drops of laudanum, divided into three doses, which were given at intervals of three-quarters of an hour, and by the end of this time the pains disappeared, everything resumed its natural order, and the gestation went on till full term.

I might multiply such citations almost *ad infinitum*, but the above is sufficient to show that, however inevitable the abortion may at first appear, we should never abandon all hopes of preventing it. I may add, that the administration of opium in the doses just indicated, or even carried to a hundred drops in the twenty-four hours, has never been followed by serious consequences. Sometimes, perhaps, a little somnolency or heaviness about the head, or a general torpor, may result, but which a few glasses of lemonade will soon dissipate. For, after all, when even death of the fœtus must have been either the cause or the effect of the primary symptoms, what do we risk in calming or arresting the uterine contractions? because, as we have already seen, the dead child may remain long within the intact membranes without any unfavorable consequences resulting to the mother. And besides, as it is almost impossible to ascertain its death with any degree of certainty prior to the fifth month of gestation, we must act in such doubtful cases just as if it were living; although there can be no question that, if the fœtus were really dead, it would be better to permit the contractions to go on, and its expulsion to be effected. But,

even supposing these are wholly suspended, the expulsion is somewhat retarded, and that is all; for after the lapse of a certain time the fœtus, acting like a foreign body in the uterine cavity, will irritate its walls, and a new labor sooner or later take place in consequence.

To these remedies (the venesection and opiate treatment) we must add strict confinement to bed, absolute rest of mind and body, the use of demulcent beverages, cold lemonade, veal-broth, chicken-water, and the application of cold compresses, frequently renewed, over the abdomen; which compresses are to be saturated with some fluid whose temperature is progressively lowered. "Local bleedings," says M. Gendrin, "are too much neglected, especially in the treatment of the utero-placental hemorrhages; indeed, we have so often had occasion to congratulate ourselves for having advised them in those cases that we now prescribe them with great confidence whenever the general condition does not directly indicate a depletory venesection. We direct them: 1. When there are any sharp pains in the neighborhood of the uterus or groins, and we apply them to the latter, the anus, or even the vulva; 2. In cases of a considerable turgescence of the hemorrhoidal tumors (if any such exist); and 3. In the phlegmasia of the adjacent organs, such as the large intestine, etc."

In these two latter cases we fully coincide in the opinion of M. Gendrin; but, in the first, we should much prefer having recourse to a general bleeding in the arm, or, as he himself advises, further on, to the application of leeches at a distance from the uterus: for instance, near the breasts, armpits, etc., etc. Finally, to the means already enumerated, we must further add the use of irritant revulsives, placed upon the upper part of the trunk and the thoracic extremities, and must also recommend in a more special manner the application of dry cups, the decidedly beneficial effects of which we have often witnessed in cases where uterine plethora seemed to be the cause of the symptoms, but where the general condition required some precaution in the use of blood-letting.

2. It has been already stated that a copious hemorrhage, intensity of the pain and of all the other phenomena, and more particularly a rupture of the membranes, render abortion thenceforth inevitable; and hence, the only course in such cases is to facilitate the expulsion of the product of conception. But still, if the hemorrhage is not of such a character during the first three months of gestation as to compromise the woman's life, the physician should remain a simple spectator of the efforts of nature, and confine himself to superintending the progress; for the expulsion of the ovum ought to be left entirely to the uterine forces. Sometimes it comes away whole, which is a very favorable circumstance. Moreover, according to the recommendation of Baudelocque, he should be very careful not to rupture the membranes, for that would only retard the delivery of the placenta, and render it still more dangerous. In fact, when the fœtus escapes alone, this latter might be attended with the difficulties pointed out in one of the preceding articles.

We should here remember how slowly the expulsion of the ovum is effected in certain cases, even when the orifice is sufficiently dilated to oppose no obstruction to its exit. This great slowness is sufficiently explained by the slight contractile power of the uterus. When no accident complicates the abortion, the physician has nothing to do but watch the progress of the labor, and expect the complete delivery to be effected by the uterine efforts. At a more advanced period, that is, towards the fifth or the sixth month, the course of the physician is very nearly the same as it would be at term. The size of the fœtus, which has now become quite large, requires a greater dilatation of the os uteri; and this, in consequence of the greater softening of the cervix, is accomplished with somewhat greater rapidity. Generally, it is necessary that the child should present one or the other extremity of its long diameter to the os uteri; however, it sometimes happens that some portion of its trunk presents there, and its delivery is neither much more difficult nor much slower than usual. It is in such cases especially that the mechanism of spontaneous evolution may be frequently observed. The delivery of the after-birth does not, as a general rule, exhibit those difficulties which it presented in the earlier months; in truth, it closely resembles the same process in the labor at term.

3. Hemorrhage is not only one of the most common symptoms, but it may follow the expulsion of the fœtus, and become the most serious feature of the case.

Whenever, notwithstanding the use of general measures, such as the horizontal position, cold drinks, the application of refrigerants to the hypogastrium or thighs, and the administration of opiates, the discharge of blood continues so great as to endanger the mother's life, an abortion thenceforth becomes inevitable, and the primary object of the accoucheur should be to bring on the contractions and the evacuation of the organ.

He should also administer general stimulants to sustain the woman's strength, and, at the same time, those medicines having an immediate action on the womb itself, such as the tincture of canella, etc., but above all the ergot. However, when the miscarriage comes on at an early stage of the gestation, these measures are often ineffectual, for it is then exceedingly difficult to excite the contractions of a viscus whose muscular organization is still so imperfect; or at least, if they are aroused, they are frequently inadequate to dilate the neck sufficiently. The tampon is then the only resource; this, when well applied, acts in two ways: 1st, by opposing the escape of the blood externally, thus forcing it to coagulate, and consequently to obliterate the bleeding vessels; 2d, by irritating the womb by mere contact, thereby determining its retraction, and the expulsion of the product of conception. This circumstance, indeed, is one of the best-founded objections to the use of the tampon in the early months of gestation. But, in truth, is it not rather an advantage than otherwise? because the cessation of the flooding is always a necessary consequence of the uterine contractions; and is the mother's life bought too dear, when it is saved by the expulsion of a fœtus which, in most cases, is dead even before the application of the tampon? Besides, this measure is not always necessarily followed by abortion. Again, there is no reason to fear the conversion of an open into a concealed hemorrhage by the employment of the tampon, before the sixth month; for, notwithstanding the observation of Chevallier, the accumulation of a large quantity of blood in the womb would seem to be impossible at this early period, without supposing an abnormal relaxation of its walls. Where, however, the pregnancy is advanced to the fifth month, the accoucheur should carefully watch the body of the uterus after the tampon is applied, and assure himself, every moment, that its volume is not increasing.

When the ovum remains intact, and the labor lasts too long, the continuation of the hemorrhage being at the same time such as to cause serious anxiety, some practitioners prefer rupturing the membranes to applying the tampon. This measure, to which I shall again allude in speaking of hemorrhage during the last three months, does not seem to me applicable before the sixth month, except in a few occasional instances, and I should, in general, decidedly prefer the tampon to it.

In fact, a rupture of the membranes is necessarily followed by miscarriage; but the tampon, when early applied, leaves some hope that the gestation may continue till term; again, the tampon always arrests the bleeding, whereas, after rupturing the membranes, it may happen that the uterus, whose muscular fibres have not acquired the contractile power which they would have at a later period, might not retract nor the hemorrhage cease, so that it might still be necessary to have recourse to the tampon.

Finally, let us add that, in the first three months, the rupture is followed almost immediately by a discharge of the waters and the escape of the fœtus; but the expulsion of the placenta and membranes is thereby rendered much more difficult.

After the complete expulsion of the ovum, the patient must observe the same precautions as are required after ordinary labor.

CHAPTER XIV.

OF EXTRA-UTERINE PREGNANCY.

The fecundation, as elsewhere stated, most frequently takes place in the ovary, and the impregnated ovule is then received by the fimbriated extremity of the tube, which applies itself on this organ, doubtless by a kind of spasmodic contraction. Having been once deposited in the tubal canal, the ovule traverses its whole length, and falls into the uterine cavity, where its development continues until term. Such is the course observed in *normal* or *uterine pregnancy;* but it may happen that the ovule is arrested, or diverted, in the route it thus travels, and ingrafting itself, so to speak, upon the point of stoppage, is there developed; in the latter case, the pregnancy is called an *abnormal*, or an *extra-uterine* one.

This species of gestation has been subdivided into several varieties, which have received different names, according to the part of the passage where the ovule becomes fixed. Dezeimeris admitted the following divisions, namely:

1. Ovarian pregnancy.
2. Sub-peritoneo-pelvic pregnancy.
3. Tubo-ovarian pregnancy.
4. Tubo-abdominal pregnancy.
5. Tubal pregnancy.
6. Tubo-uterine interstitial pregnancy.
7. Utero-interstitial pregnancy.
8. Utero-tubal pregnancy.
9. Utero-tubo-abdominal pregnancy.
10. Abdominal pregnancy.

Such was the classification which, in an anatomo-pathological view, was adopted in the first six editions of this work. We now think it would be better to make a more simple arrangement, and shall, accordingly, describe but five varieties of extra-uterine pregnancy:

1. Abdominal pregnancy.
2. Tubo-abdominal pregnancy.
3. Tubal pregnancy.
4. Interstitial tubo-uterine pregnancy.
5. Utero-tubal pregnancy.

1. *Abdominal Pregnancy.*—To render fecundation possible, it is necessary that there should be direct contact between the sperm and the ovule, and, consequently, that the Graafian vesicle should burst into the abdominal cavity of which it, for the moment, forms a portion. But, should the fecundated ovule, instead of engaging in the tube, remain in the just ruptured ovisac and be retained at the surface of the ovary, or fall into the peritoneal cavity, its development gives rise to an extra-uterine pregnancy which we shall designate under the general name of *abdominal pregnancy.* Three varieties of this class will be recognized: in the first, the fecundated ovule is still contained in the just ruptured ovisac, and is developed upon the spot: the pregnancy is then styled *internal ovarian.* In the second variety, the fecundated ovule, having escaped from the Graafian vesicle, adheres to the surface of the ovary, where it undergoes development: this is called *external ovarian* pregnancy. Finally, should the ovule, after leaving the ovary, attach itself to some part of the peritoneum, it receives the name of *peritoneal pregnancy.*

In *internal ovarian* pregnancy, the ovum is developed within the ovary itself. This variety has given rise to numerous scientific discussions, inasmuch as it was for a long time admitted that the ovule could be fecundated without previous rupture of the Graafian vesicle. Amongst the observations pleaded in favor of this hypothesis, one related by Bœhmer ought to be mentioned. He describes with much care both the membrane proper of the ovary itself and its peritoneal envelope. M. Velpeau, however, very justly observes that it is often extremely difficult to determine precisely the point of departure of the tumor; therefore we admit with him that, in this species of pregnancy, the ovisac is always ruptured. If the minute wound resulting from it be not evident when the dissection is made, it is because it has been obliterated by the process of cicatrization and the production of a newly-formed membrane.

External ovarian pregnancy cannot be doubted. It is, relatively speaking, quite common, and the fecundated ovule retains its intimate connections with the ovary upon which it is applied whilst undergoing development in the abdominal cavity.

Peritoneal pregnancy was for a long time contested, but is now supported by so great an array of facts, observed both in women and animals, that it is impossible to deny its occurrence. It has, doubtless, often been confounded with the ovarian and other forms, but in several published cases there can be no question that the ovum had no connection with the internal generative organs. M. Dezeimeris makes two varieties of this form of pregnancy, viz.: *primitive* and *secondary.* In the former, the product of conception has never been located elsewhere than in the peritoneal cavity, into which it fell on quitting the ovarian vesicle; in the latter, on the contrary, the first development of the ovule took place in the ovary, the tube, or the walls of the uterus, but at a later period extreme distension or pathological alteration of the walls of the tumor caused their rupture, and the ovum being partly or wholly expelled from the containing cyst, became lodged in the cavity of the abdomen, where it was at last found. The secondary abdominal pregnancy of M. Dezeimeris is, therefore, merely a tubal or interstitial pregnancy, ending in rupture of the primitive cyst. Whether, therefore, this rupture occurs at a very early period or at the regular term of gestation, it deserves to be regarded merely as an epiphenomenon, and can, in no case, constitute a distinct variety. We apply, therefore, the name *peritoneal pregnancy* to that form in which, from the very outset, the ovule has become adherent to some part entirely distinct from the internal generative organs. The points at which it may thus attach itself are extremely numerous, so that the placenta has sometimes been found inserted upon the peritoneum, covering the right or left iliac fossa, sometimes to the mesentery, or to a part of the small and large intestine, and sometimes, finally, to the anterior wall of the abdomen.

Most of the cases described by Dezeimeris as *sub-peritoneo-pelvic* pregnancies belong, we think, to the peritoneal variety. The author applies the former name to cases in which the ovule was unable, after leaving the ovary, to engage in the external opening of the tube, but slipped between the two layers of the broad ligaments

and was developed there. According to his view, the ovum here is outside of the peritoneum, and remains principally in the pelvic cavity. Cases of the kind, he thinks, are not rare, and, on account of the situation of the ovum, are to be reckoned amongst the least dangerous. The position is, indeed, remarkably favorable to the spontaneous expulsion of the debris of the fœtus, or makes them easily accessible in case it should be thought necessary to abstract them. Whilst accepting this prognosis, we think that Dezeimeris is in error as regards the slipping of the ovule between the two layers of the broad ligament; it seems to me impossible that it should follow this route. The observers were, in these cases, deceived by the fact that upon opening the abdomen the peritoneum of the lesser pelvis seemed to be raised by a subjacent tumor. The appearance, however, misled them, for the tumor is not, really, covered by the peritoneum, but by a newly-formed false membrane, which soon acquires the shining and polished appearance of a serous membrane, and which blends, without a well-marked line of demarcation, with the surrounding peritoneum. If this pseudo-membrane be incised, a careful dissection will reveal the true peritoneum below the fœtal cyst. The tumor, therefore, is not extra-peritoneal, but intra-peritoneal. In short, the same phenomenon occurs here which for a long time sustained the idea that retro-uterine hematocele was seated outside of the peritoneum.

2. *Tubo-abdominal Pregnancy.*—It is evident that, if the tube be obliterated near the enlarged extremity, the ovule which has scarcely entered its canal will be arrested; and if the development occurs at this point, the tubal walls will necessarily be dilated, and one portion of the surface of the ovum be free in the abdominal cavity; to this variety the name of *tubo-abdominal* is applied. The placenta is attached in the interior of the tube, and the fœtus developed in the abdominal cavity, and both are surrounded by a cyst, the walls of which are partly made up by the parietes of the tube.

We include in the tubo-abdominal pregnancies those cases which have been described under the name of *tubo-ovarian.* In this the cyst, which surrounds the fœtus, is formed partly by the ovary, and partly by the opening of the dilated tube, whose extremities have contracted some adhesions with the ovarian tunic.

The following case of Dr. Jackson's is justly quoted by M. Dezeimeris as serving for a type. A woman, aged thirty-two years, was seized, in consequence of a violent blow on the epigastrium, with some inflammatory symptoms, to which she speedily succumbed; at the autopsy, a large quantity of blood was found diffused in the abdomen, and a fœtus of about ten weeks was found enveloped in an enormous clot; the fundus uteri rested against the pubis, and its cervix near the middle of the sacrum. This change from its natural position had been produced by a tumor situated on the left side of the womb, which tumor was formed by the ovary, the Fallopian tube, and the broad ligament, that had become considerably thickened and modified in their structure; the fringed extremity of the tube adhered intimately to the ovarian envelope, and a cyst was formed by these two organs, whose distension by the body contained therein had produced the rupture.

In another case, related by Bussières, which seems to me equally conclusive, the tube on the right side was extremely dilated at the extremity; and this dilatation, which was an inch in its largest diameter, extended for rather more than an inch and a half in length, gradually diminishing as it approached the womb. The portion of the tube thus dilated was curved on itself, and embraced nearly the whole ovary, to the membrane of which it was so adherent that it could not be separated without rupturing the attachments. An unctuous, limpid fluid escaped as soon as it was opened, and then the ovum appeared, which was about the size of a hazle-nut, and was surrounded by the liquid; three-fourths of it had already escaped from the hole made in the ovary, so that it no longer seemed to rest there; yet, on attempting its removal, it was found attached by a hard pedicle covered with blood-vessels.

3. *Tubal Pregnancy.*—This is the most frequent of all the varieties of extra-uterine pregnancy; which fact is readily accounted for by the length and narrowness of the canal, and by the adhesions and morbid obliterations presented by its walls. Under such circumstances, the ovule is arrested and developed at some point between its abdominal extremity and the spot where it enters the uterine parietes; and by its continual growth distends enormously the fibres of the tube which constitute the envelope of the fœtal cyst. To the numerous cases of this kind reported by Velpeau and Dezeimeris, I might add another, already published by me in the *Bulletin de la Société Anatomique*, but so many examples are everywhere met with that it seems useless to reiterate their details. Dr. Lesouef's thesis may be advantageously consulted on this point.

4. *Interstitial Tubo-uterine Pregnancy.*—In this case the ovum is arrested in that part of the tube which traverses the thickness of the uterine walls; and although this is its principal characteristic, two varieties have been made of it, of which we shall say a few words.

In the first variety the walls of the tube, yielding to the distension occasioned by the development of the ovum, press back the surrounding tissue proper of the uterus, but always form the most internal layer of the cyst in which the product of conception is enclosed.

In the second variety the ovule reaches that part of the tube which traverses the uterine walls; but having arrived there, it opens a way through the tubal parietes, penetrates into the midst of the fibres of the womb, and thenceforth has no further relation with the tube; hence, the surrounding cyst is formed by the muscular fibres of the womb alone.

After having been once located among the uterine fibres, the ovum may either take an inward or an outward direction, and consequently may become seated near the mucous layer, or else to the peritoneal coat. In a preparation belonging to M. Pinel Grandchamp, the volume of the uterus was about the same as at six weeks or two months of pregnancy; at its left angle, a small tumor, slightly ruptured behind, constituted the cyst containing the product of conception. The tube, which passed behind it, communicated with it by an almost microscopic orifice, and presented nowhere any increase of calibre. The cyst was about large enough to contain an almond.

5. *Utero-tubal Pregnancy.*—Notwithstanding the free communication existing between the tube and uterine cavity, there is no absurdity in the supposition that the ovule may become deposited in a little depression of the mucous membrane, and there stop and ingraft itself, just at the internal orifice of the canal. In this case, phenomena similar to those of the tubo-abdominal gestations will arise: that is, the ovule, which may have contracted some intimate adhesions with this extremity, may, by its development, encroach upon the uterine cavity itself; and I do not hesitate, therefore, to consider this variety of gestation as possible.

It is probable that certain singular cases described by Dezeimeris under the name of utero-tubo-abdominal pregnancies belong properly to tubo-uterine pregnancies. In this variety, examples of which have been furnished by Patuna, Hunter, and Hoffmeister, the fœtus is found in the abdominal cavity; the cord leaving the umbilicus enters the Fallopian tube, traverses its whole length, and is inserted in the placenta, which itself is attached to the internal surface of the uterus. However extraordinary these facts may appear, I think that no one can doubt them after reading the subjoined case, taken from the memoir of M. Dezeimeris.*

* Helen Zopp, aged 35 years, had been married for twelve years, and had given birth to eight children, two being twins.

As she was preparing for church on Sunday, July 10th, 1763, she was suddenly attacked, after a violent fit of anger, with a profuse flooding and the pains of child-birth (being then at term); however, she did not pass the waters, but what proved to be pure blood; and she felt the motions of her child up to the last moment. The midwife, summoned on the occasion, declared at once that the accouchement was at hand; but after the lapse of several hours, as the loss of blood continued without any positive signs of an approaching delivery, a physician and a surgeon were simultaneously sent for, the former of whom soon arrived, and recognizing at once the imminence of the danger, he ordered the

We explain them by supposing the existence of a tubo-uterine pregnancy ending in rupture of the tube with passage of the fœtus into the peritoneum, whilst the placenta remains in the uterus. The cord traverses the tube in its passage from the fœtus to its placenta.

We have not been able, from the restricted limits of this chapter, to bring forward a larger number of cases, but sufficient has been said to furnish an idea of the importance that ought to be attached to the different varieties of extra-uterine pregnancy admitted by us.

The reader may consult with benefit the article of Professor Velpeau, in the fourteenth volume of the *Dictionnaire de Médecine*, the learned memoir published by M. Dezeimeris, in the fourth year of the *Journal des Connaissances Medico-Chirurgicales*, and the able articles of Messrs. Breschet, Menière, and Guillemot.

The physiological and pathological history of these different pregnancies is yet to be given, and we shall therefore commence with their pathological anatomy.

§ 1. Pathological Changes.

The anatomo-pathological examination of extra-uterine gestations evidently comprises the peculiarities offered both by the product of conception and the parts of the mother.

A. *Product of Conception.*—In these pregnancies the ovule has its proper membranes, the chorion and the amnion. I may state that I was utterly astonished to hear several honorable members contend, in a recent discussion before the Academy of Medicine, that the envelope of the ovule, in abdominal gestations, was only composed of the amnios, and that no chorion existed; for although, in certain very old pregnancies, the most exterior fœtal membrane is confounded with the walls of the cyst, it is not fair to conclude from thence that it did not exist at the commencement.

Indeed, it is only necessary to recall our remarks on the mode of development of the ovum, to comprehend that the absence of the chorion supposes that of the allantois, and without the latter no circulatory relations can be established between the embryo and its mother.

The structure of the walls of the cyst varies according to the species of extra-uterine pregnancy. In the tubal variety, they are formed by the walls of the tube itself, and in the internal ovarian, by the integuments of the ovary.

In the so-called sub-peritoneo pelvic gestation, or whenever the ovule, that was originally located in the ovary, tube, or even the uterus, is transferred, after the rupture of the cyst which inclosed it, to some part of the abdominal cavity, there is besides a pseudo-membranous cyst, representing the uterine decidua, produced by the inflammation which the presence of the ovule determines around it. But this enveloping membrane, the cyst, does not exist in primitive peritoneal pregnancies. M. Dezeimeris thus explains the latter circumstance: When a fecundated ovule gets into the abdominal cavity immediately after quitting the ovary, we can readily believe that a corpuscle so minute, soft, and fragile could only produce a very slight irritation at the point of arrestation, and that the extent of this excitation will not pass beyond the limits of contact with the little foreign body; in a word, it cannot produce an acute inflammation, or extensive adhesions, nor an exudation of plastic lymph sufficient to form an enveloping cyst. Now, if it has not primarily caused all these derangements, the neighboring organs will not be injured by its ulterior development, because they become gradually habituated thereto; and the ovule, having obtained a right of possession, lives, grows, and presents to the smooth, polished surfaces which touch it, a surface equally smooth, polished, and moistened at their expense: and not having occasion for any other protecting envelope, no cyst is formed. But when a voluminous product of conception suddenly bursts, and its contents, placed at first like it in the tube or ovary, are transported to the peritoneal cavity, the ovule becomes there a foreign body, wounding and irritating the abdominal organs which are unaccustomed to its vicinity, and determining an acute inflammation around it, which results in the exudation of plastic lymph; this, by coagulating, forms a cyst, and completely isolates the foreign body. If, under these circumstances, the displacement of the fœtus is such that it completely escapes from the amniotic cavity, and suddenly locates itself with its surrounding liquid in the midst of the intestinal mass, an inflammation occurs, and the cyst we have just described forms around it; the new cyst then completely environs the fœtus. But in some cases the displacement is not so complete—the largest part of the trunk may still remain in the amniotic cavity after the rupture, a portion only being displaced, and the latter alone first determines an inflammation around it, and then the exudation, which is transformed into a false membrane; this, by uniting with the lacerated margins, forms only a part of the fœtal cyst, the remainder being constituted by the old fœtal envelope, the walls of the Fallopian tube, for instance, in the case of a tubal pregnancy. The same relations may be established with the membranes of the ovule when the chorion and amnion are ruptured at an advanced period in a case of primitive abdominal pregnancy. For instance, in a case cited by M. Dubois, the cyst that inclosed the fœtus was formed of a membrane which was not altogether uniform in its structure and appearance: thus, for the greater part of its extent, the internal surface was of a light-brown color, owing perhaps to the imbibition of the adjacent liquids, and simulating, both to the touch and sight, the aspect of the mucous membrane of the small intestines, or, still better, the accidental membranes that occasionally line fistulous canals; while at other points, those

administration of the sacraments, at the same time prescribing divers remedies for the discharge. The venesection of the cephalic vein was followed by a profound syncope, without causing the least abatement of the metrorrhagia; and the sacraments had scarcely been administered, when the patient died, at 11 A. M. on the same day.

Patuna and his father (the public surgeon to the city) arrived just as she was expiring. After assuring himself of her death, he immediately made a Cæsarean section upon the right side, where the abdomen offered the most resistance, and, as soon as the ventral walls were divided, an enormous fœtus, resembling a child nine months old, presented itself; the position was such that its back corresponded with the abdominal parietes of the mother; the head was somewhat inclined, was directed towards the vertebræ, and rested immediately under the diaphragm; the knees flexed towards the head, the right hand upon the thighs, and the left near the navel: the umbilical cord was of considerable length; it ascended to the right, wound around the neck, and then entered the Fallopian tube on the right side. A case of extra-uterine pregnancy being new to Patuna, although acquainted with most of the published examples, his researches were made in the most careful manner.

Having enlarged the opening made in the abdomen, so as to examine its cavity to better advantage, he sought for the fœtal envelopes with all possible attention, but in vain; for he neither found the amniotic liquid, nor fluids of any other kind in this cavity. By tracing the umbilical cord with his hand, he found that it penetrated into the right tube at the distance of a finger's breadth from the uterus; the uterine portion of the tube was more voluminous than that part which ran to the ovary, whence he judged that the cord passed through the former into the womb.

This organ was larger than the fist, and had the natural pyriform shape, but not the least vestige of any rupture; not the smallest cicatrix could be seen, and it hardly rose above the pelvis.

These observations being concluded, Patuna incised the tube from the entrance of the cord towards the uterus: this presented nothing peculiar, excepting the adherence to the cord where the latter perforated it. The uterus was then opened, and exhibited no trace in the interior of any previous laceration whatever; the walls were an inch and a half in thickness, and their substance was nearly bloodless; the placenta was found within adhering to a narrow space at the fundus, a little to the right; it extended more towards the left, but was there detached. It was about two fingers' breadth in thickness, and four inches in diameter, and it commenced very near the uterine opening of the right tube, and adhered more strongly there than at any other place. The extremities of some vessels were evident both on its convex surface and at the fundus uteri upon which it was ingrafted; its concave face, from the middle of which the cord arose, was covered by two membranes: one, the interior, being thicker and vascular, while the exterior was very thin and translucent; but these joined when they approached the border of the placenta, forming there a more solid substance, and having some very delicate vessels ramifying through it. The internal uterine orifice would hardly admit the little finger.

Everything else remained in a natural state, excepting the change in the situation of the intestines. (Barthelemy Patuna.)

for instance which were near the circumference of the placenta, and on the largest part of this surface, the cyst was more smooth and polished; presenting, in fact, the ordinary appearance of the amnion.

The cyst was simple, and about a fourth of a line in thickness at the part where it exhibited the brown and villous character above alluded to; but on the contrary, where the surface was smooth and polished, it evidently consisted of two membranes (the chorion and the amnion).

In all cases, numerous and large vessels form in the walls of the cyst whose rupture it is evident must give rise to hemorrhage, which very often proves fatal to the mother.

When an extra-uterine pregnancy is somewhat prolonged, these envelopes are sometimes destroyed, being perforated with fistulous canals, communicating directly with the intestinal canal, vagina, bladder, uterus, or an external abscess. At times, the destruction of the cyst is partial, at others complete; so much so, indeed, as to leave in certain cases no vestiges of its former existence; on the other hand, the envelopes sometimes undergo osseous or cretaceous transformations, which may convert them into solid shells. As a general rule, the fœtus exhibits nothing peculiar in its development: for example, in several cases studied anatomically a long time after the term of pregnancy, the osseous system appeared to have a better development than in the ordinary child of nine months. The existence of several teeth has frequently been noticed, or else traces of the eruption of these little bones, which would seem to afford an indication that the fœtus continued to live and grow beyond the ordinary term of gestation.

The most common of the numerous alterations which it may undergo is the putrescent dissolution of its soft parts, from macerating in a compound of amniotic liquor, blood, and pus; the separation of the various pieces of its skeleton, and their discharge through the divers routes just mentioned. At other times it seems to have undergone a kind of mummification, a complete drying-up. Again, in other cases, all the tissues appear to be transformed into an osseous or cretaceous substance, or into one resembling adipocire—and here, it is doubtless unnecessary to add, it is no longer possible to discover any trace of the fœtal membranes.

B. *Tissues of the Mother.*—Some very large vascular canals are seen to develop themselves in those parts where the ovum is attached, however devoid of blood-vessels they might have been previously; and several great veins are found to ramify under the peritoneum towards the circumference of the placental attachment; and where the ovary or the tube happens to be the seat of pregnancy, it presents a soft tissue, apparently fungous in character, and impregnated with blood.

The womb does not continue so indifferent to the advancement of the extra-uterine pregnancy as might be supposed; for its volume increases in a remarkable degree, the tissues become softer, and the mucous membrane hypertrophied and more vascular, so as to form from the outset a true decidua. M. Velpeau, however, disputes this last assertion; but I have endeavored to refute his opinion in the *Bulletin de la Société Anatomique* (Sept., 1836), to which the reader is referred.

This hypertrophy of the uterine mucous membrane is of short duration. For, as the ovum does not enter the uterus, it has no office to perform, and, therefore, like every other useless organ, becomes atrophied, loses its vascularity, and in a few months has returned to its usual condition. A gelatinous substance, a kind of thick, ropy mucus, is also frequently found in the neck of the uterus; but when the pregnancy has advanced beyond term, the womb gradually regains its natural condition. Finally, in certain cases, the calibre of the Fallopian tube has been found obliterated at some part of its length.

§ 2. Symptoms and Diagnosis of Extra-Uterine Pregnancy.

During the early months it is exceedingly difficult to recognize the existence of an extra-uterine pregnancy; for the modifications which then occur in the size, form, and consistence of the body and neck of the uterus will certainly lead to error, and give rise to the belief of a true gestation. With regard to the menstruation and the lacteal secretion, no constant rule is observed. Sometimes the menses continue to appear; at others, they do not. In some instances this function is not re-established, even after the period when the accouchement should have taken place; and similar variations are met with in the secretion of milk. Again, menstruation has been known never to appear during an extra-uterine pregnancy which lasted more than thirty years, while the lacteal flow continued throughout the whole of that time.

There are, likewise, some abdominal pains, at a period not very distant from the date of conception, more or less analogous to the uterine pains, and at times a constant, fixed, circumscribed one in the pelvis, groin, or umbilical region. (The woman whose preparation I presented to the Anatomical Society had on this account been treated for a partial peritonitis.) Not unfrequently there is an inability to lie upon one side. When the tumor, whilst still small, falls into the lesser pelvis, it pushes the uterus forward, the neck being directed in front and quite high behind the pubis. This displacement of the neck of the womb, together with the presence of a large tumor occupying the excavation posteriorly, and the dysuria occasioned by the pressure made upon the neck of the bladder, has been mistaken for retroversion. Several examples of this error are mentioned by Burns.

At a later period the tumor rises above the superior strait. The motions of the child are felt at the usual time, but they appear to be more superficial, and are generally felt on one side only.

The labor-pains come on at the natural term, or at the seventh month, or even sooner, generally lasting for three or four days, but occasionally much longer; and, should the pregnancy be unusually prolonged, they are apt to return at varied intervals, and again pass off.

Schmidt reports a case where the gestation lasted three years, within which period the labor-pains were renewed eight times, and on each occasion continued for several weeks.

In another gestation, of ten years' duration, the pains returned annually at the period corresponding to the term of pregnancy.

These pains are not produced by contraction of the walls of the cyst, as many have stated; because, excepting the cases of tubal and interstitial pregnancy, they never contain any muscular fibres, and hence we must search for the cause in the uterus itself; for the great development exhibited by this organ, and the mucous and albuminous matters inclosed in its cavity, the expulsion of which requires some contractions, sufficiently account for the pains experienced by the patients. But it is exceedingly difficult to explain in a satisfactory manner their frequent coincidence with the usual term of gestation.

The physical signs which require our notice are, the changes in the uterine body and neck, just indicated, the more or less irregular development of the belly, and the possibility, in some cases, of distinguishing two tumors, one being the uterus, while the other is formed by the abnormal cyst.

In the sub-peritoneo-pelvic variety, the product of conception, by occupying the pelvic excavation, displaces and compresses the organs there situated, the vagina and rectum, for instance, and pushes them to one side. The vagina and rectum are found to be obstructed by a tumor situated between them, and frequently the different parts of the fœtus may be detected by the vaginal touch.

The fœtus seems to be much nearer the surface in the abdominal pregnancy than in either of the other varieties, hence its motions are more easily perceived, and are more distressing to the mother, and the forms of the different parts more clearly distinguishable. Besides, the rounded and regularly circumscribed tumor formed by the uterus in a normal gestation is not present.

In the tubal and ovarian varieties, says Baudelocque, the fœtal movements should be less vague, and its limbs more retracted. The body of the uterus is associated with the tumor formed by the fœtal cyst, and can neither be separated nor readily distinguished from it.

I have thus brought forward the various signs by which authors

endeavor to detect the different species of extra-uterine gestation, although they have, in my estimation, but little practical importance; nor do I see that auscultation itself could render us much service in determining the diagnosis.

I ought to observe that the possibility of a fresh fecundation is a feature common to all the varieties of extra-uterine pregnancy.

Perhaps it may be serviceable to note that the vacuity of the uterus might be detected by the touch. Very frequently its habitual position will be changed by the pressure of the tumor, more especially when the latter occupies the excavation, and urges it against some part of the pelvic walls.

Finally, when by the usual signs we have become assured of the existence of pregnancy, and we suspect that it is extra-uterine, the diagnosis will be reduced to a certainty if we can determine the capital point, which is, that the uterus is empty. Now we have just seen that this knowledge can be arrived at by means of palpation and the touch. Professor Stoltz was the first to use the uterine sound for the same purpose; but it will be readily understood why great prudence should be exercised in deciding to employ it. In case of a normal pregnancy, the sound would, in fact, be almost sure to produce abortion, and then the mistake would be irreparable. The use of the uterine sound is more rational and truly useful when the question to be decided is, whether there be an extra-uterine pregnancy or a fibrous tumor of the uterus.

§ 3. Progress and Termination.

It is but rarely that an extra-uterine pregnancy is prolonged beyond the fourth or fifth month; for generally the walls of the cyst give way in consequence of their distension, before it has had time to become very large. Sometimes, however, the fœtal envelopes resist the pressure to which they are subjected, and if the fœtus itself do not perish through want of nourishment, or by some accidental disease, its development may progress until term, and it may even live for some time after the expiration of the ninth month. Such is reported by Dr. Grossi to have been the case with a lady, who, in all probability, carried an extra-uterine fœtus, whose motions were perceived clearly by himself and several consulting physicians, through a space of fourteen months. Usually, the child perishes either before or shortly after the term of pregnancy; and we shall now proceed to point out the possible consequences of its retention.

A. *Rupture of the Cyst.*—When left to itself, an extra-uterine pregnancy will generally terminate in a rupture of the cyst; but the time and consequences thereof are very variable. Were we to class these pregnancies according to the frequency of the rupture, and the early period of its occurrence, they would stand as follows: the tubo-interstitial, tubal, and abdominal.

It is very rare for the period of the rupture to extend beyond the middle term of pregnancy, except in the last variety. Dr. Lesouef very properly dwells on the tendency of tubal pregnancies to rupture at a very early stage of gestation. According to the same author, and to M. Bernutz, his master, if the rupture of the tube occurs at one of the points where it is covered by the peritoneum, the consequent effusion takes place into the peritoneal cavity; this, however, is not necessarily so, because the tube might give way at its adherent edge, and allow the ovule to slip between the two layers of the broad ligaments. In this case, the result would be a true consecutive sub-peritoneo-pelvic pregnancy.

The rupture, which is usually spontaneous, always gives rise to exceedingly grave phenomena, which may be described as the primitive and secondary consequences. Thus, the patient at once suffers from violent pains for several hours; then, after a pain which is much stronger than all the others, a perfect calm comes on. The abdomen sinks, or becomes flattened, and the former tumor disappears; a gentle and equal heat spreads over the abdominal cavity, and if the pregnancy is well advanced, the patient feels as though a voluminous body had been suddenly displaced; the skin loses its natural hue, faintings come on, the pulse is small and contracted, a cold sweat covers the whole body, and death frequently follows, because the rupture of the cyst is often the immediate cause of a hemorrhage that speedily proves fatal. Should any circumstance whatever arrest the hemorrhage, the first symptoms that follow the displacement of the product of conception, and the transference of the waters, blood, or even the fœtus itself, to parts not accustomed to such contact, are those of a very violent peritonitis. The patient generally dies, though sometimes she is able to resist the violence of the first inflammatory symptoms, in which case the course of the disease differs from that time, according to whether the debris of the pregnancy are to be inclosed in a cyst of new formation for the remainder of the patient's life, or whether they are to be eliminated in various ways. In the first case, the fœtus may undergo all the transformations described under the head of the pathological anatomy; and in the second, the symptoms vary with the manner in which the elimination is effected.

B. *Prolonged Retention of the Cyst.*—As we have already stated, the peculiarities of extra-uterine pregnancy, when the integrity of the cyst allows the development of the fœtus to proceed until term, and even somewhat beyond it, we shall not reconsider it. We would, however, add that in some cases the disorders of the general health, produced by the development of these abnormal pregnancies, have been so great as to prove fatal, without there being any discoverable lesion to account therefor. Thus, says M. Jacquemier, the autopsy reveals neither rupture of the cyst, nor a trace of hemorrhage, peritonitis, nor process of elimination going on in the cyst: the unfortunate sufferers appearing to have succumbed under a kind of exhaustion of vital power.

The development of the cyst ceases with the life of the fœtus, the circulation in its walls becomes feebler, the vessels which maintain the connections necessary to the support of the fœtal life gradually become atrophied, and even in great part obliterated; so that the fœtus and its envelopes are thenceforth a foreign body within the organism of the mother. Occasionally the latter becomes accustomed to their presence; for some women carry a fœtal cyst for many years without their health appearing to be much injured thereby: we have mentioned what transformations the fœtus and its envelopes are liable to undergo in such cases. Sometimes, however, the weight of the tumor, and the pressure which it exerts upon the neighboring parts, disturb the general functions so seriously as to make the female demand earnestly to be relieved of the cause of her suffering by an operation.

Whether the tumor be the cause of acute pain to the woman or not, it is likely, after the lapse of an indeterminate period, to become the seat of an inflammation, which extends rapidly to the neighboring parts. In consequence of this inflammation, which may progress with greater or less rapidity, adhesions are contracted between the walls of the cyst and the parts adjacent; ulceration begins at the points of adhesion, perforation follows with the formation of communications between the cavity of the cyst and that of one of the neighboring organs, or with the exterior, in case the abdominal walls be invaded by the ulceration.

The fœtal debris find their way to the exterior, at times by the bladder, rectum, vagina, and even the stomach, at others by means of an abscess opening into the perineum, or through the anterior abdominal parietes. Furthermore, since these latter communications are common to all kinds of extra-uterine pregnancies, we can understand that the situation of the fœtus in the sub-peritoneo-pelvic variety, which, as before stated, is the most deeply engaged in the excavation, will render its expulsion by the vagina or rectum more frequent than in the others.

Most generally some one of the above-mentioned organs serves as an excretory canal, but in certain cases several of them are simultaneously attacked by the adhesive inflammation; of course, ulceration and perforation soon follow; and the wreck of the fœtus escapes at once by the anus, the vagina, and through a fistulous opening in the abdominal walls.

This expulsion greatly endangers the mother's life—for very often the inflammation and suppuration of the cyst, by spreading to neighboring parts, exhausts the patient, and sooner or later she

succumbs. In the more fortunate cases, the sac is gradually emptied, cleansed, and contracted, the suppuration ceases, and the wound cicatrizes, or at least becomes a simple fistulous ulcer.

The long-continued suppuration, and consequent exhaustion of the patient's strength, will always render a complete expulsion of the foreign bodies highly desirable, for nothing else will put an end to the suppuration and allow the fistulas to close. Unfortunately, the hair, teeth, and pieces of bony substance adhere very strongly to the walls of the cyst, in which they seem to be imbedded, and are detached with difficulty; yet it is very necessary to be careful not to use too much force for their extraction, lest the walls of the cyst should be torn, and an opening made between it and the cavity of the peritoneum, rendering liable the occurrence of a quickly fatal peritonitis. The interference of the surgeon should be restricted to the dilatation of all the openings and fistulous passages by means of compressed sponge, to cleansing injections within the cyst, and to the withdrawal, by means of forceps, of the *completely detached* portions of bony matter which present themselves at the openings. In no case, I repeat, should any effort be made to detach the strongly adherent portions.

§ 4. Causes.

Nothing can be more obscure than the causes of extra-uterine pregnancy, although numerous facts would seem to prove that the action of terror, coinciding with the time of fecundation, may produce such an effect as to prevent the impregnated ovule from being ulteriorly transported into the uterus; but notwithstanding the high authority of those who have adopted this doctrine, it does not appear to be admissible, since the ovule does not abandon the ovary at the moment of conception, but several days after or even several days before this event.

M. Dezeimeris brings forward one case that seems to prove that a blow on the hypogastrium a short time after a fruitful coition may be the cause of this anomaly, though I should rather refer it to a particular disposition of the mother's organs. When, indeed, we consider the narrowness of the tubal canal, we can readily conceive that any deviations, even slight ones, of the Fallopian tube, any paralysis or spasm, an excess or defect of length, an engorgement, the swelling and ulceration of the mucous membrane, or hardening of its pavilion, or any retraction at the internal orifice; in one word, all the anomalies and alterations described by authors may take place there, and give rise to it. I myself have had an opportunity of observing two cases (reported in the *Bulletin de la Société Anatomique*) in which the tube was obliterated between the point where the ovule was developed and the internal orifice of this canal.*

Finally, if we take into consideration the singular anomaly described by M. G. Richard, we may suppose that the fecundated ovule might, in its progress along the tube towards the uterus, escape through one of those accidental openings, and so fall into the abdominal cavity.

§ 5. Treatment.

* The obliteration of the tube in the case referred to is so remarkable an occurrence, that I endeavored to learn, by referring to various authors, whether similar cases had been reported. Most of them have not observed the state of permeability or impermeability of the tube; others, on the contrary, have given their attention to this point. Thus, Smellie (vol. ii. p. 77) quotes an observation of Dr. Fern, in which an obliteration, or rather an excessive retraction of the tube was described. In the memoir of M. Breschet, on interstitial pregnancy, I found several instances where the obliteration of the uterine orifice was also noted. M. Mayer communicated a case to M. Breschet, where the fœtus was developed in that part of the tube which traversed the substance of the uterine walls; M. Mayer further remarks, that the right tube was dilated at its fringed extremity, contracted in the uterine portion, and was completely obliterated at about three lines from the uterus; the left one, in which the ovule was developed, was permeable as far as the morbid mass, but from this point to the uterus the canal ceased. He adds: It is very probable that an induration of the uterine substance formerly existed at the insertion of the left tube, which caused the occlusion of its orifice, *and furnished an obstacle to the passage of the ovule.*

M. Schmidt reports that in an example of interstitial pregnancy, of six weeks, the internal orifice of the right tube was completely closed. (The ovule was developed on the right side of the womb.)

M. Menière (*Archives*, June, 1826) furnishes a case of interstitial pregnancy located in the left cornua, and he says the left tube was impermeable at its internal part.

M. Gaide, in a similar instance (*Journal Hebdomadaire*, t. i.), ascertained that the right tube had no uterine orifice.

Another case is reported in the *Archives* of a mortal hemorrhage produced by tubal pregnancy. The author adds: "The left tube (the ruptured one) formed a consistent membranous sac, and its free extremity embraced the whole ovary; below the dilatation and in the uterine portion, the canal was completely obliterated in such a manner that it was wholly impossible to reach the uterus through it."

I might cite a greater number of examples, but I think these will suffice to prove that an obliteration of the tube is sometimes met with in extra-uterine pregnancies; for whenever we find the canal effaced between the ovule and uterus in a tubal gestation, it seems natural to suppose that, if the product of conception has been arrested in the course it has to travel in order to reach the uterus, some mechanical obstacle has opposed its passage, and that the effacement is the cause of such hindrance in the progress of the ovule; consequently, the cause of this variety of gestation, at least, seems to me clearly indicated. But how long has the effacement existed? Was it prior or subsequent to the conception? In reply, it may be said that, according to the ideas generally admitted by physiologists, an obliteration of the tubes is an infallible ground of sterility, and when met with in a pregnant woman it would be absurd to suppose that such an obstacle was in existence before impregnation. In this case, the seminal fluid could not reach the ovule, for its only way is closed up and the fecundation cannot occur.

Let us examine, however, whether this is the only admissible opinion: it is well known that the obliteration of a canal, lined internally by a mucous membrane, can only result either from the coagulation of a secreted liquid, the chronic engorgement of its walls, or from their adherence to each other; and in either of these cases it is necessary to suppose the existence of a previous inflammation; but in neither of the instances mentioned have I noticed that the females exhibited any peculiar phenomena during the early periods, those immediately following the fruitful coition. Again, even supposing the inflammation is latent, and too feeble to produce any sensible effects, we must admit that its progress has then been very slow, and that it could not determine an obliteration of the walls (whatever be the mode of its action) until after the lapse of a considerable time; now the ovule, at the earliest, arrives in the womb about the tenth day, and therefore the inflammation and the subsequent effacement must take place within that short period; but, even admitting this hypothesis to be true, some cause for this phlegmasia in the tube must be assigned, and the partisans of that opinion have not hesitated to assert that it is either produced by the irritation, and the sanguineous congestion, experienced by all the genital apparatus at this period, or by a spasmodic condition of the tubal walls, or further, by the presence of the ovule itself.

I shall reply to this perfectly hypothetical explanation by simply presenting a single fact. It is this. In some of the cases related in the memoir of M. Breschet, and in several others from different writers, not only was the tube that served as the seat of gestation obliterated, but also the one on the opposite side; and consequently, in these instances at least, we cannot admit that a spasm of the walls, or any irritation from the ovule's passage, was the cause of effacement, and therefore we have to believe that it existed previously.

From all which it follows, as a natural consequence, that, contrary to the opinion generally received, it is not necessary for the sperm to pass successively through the uterus and the Fallopian tube, so as to approach and fecundate the ovule; and, further, this conclusion permits the adoption of certain facts which have been rejected as improbable; for we can explain by it how, in some females, there may happen to be a complete occlusion of the os tincæ at the period of labor; how, in others, the fecundation has taken place without a proper introduction of the membrum virile, the physical proofs of virginity even remaining at the time of labor.

But how, then, can conception be explained? Without adopting the theory of the *aura seminalis*, Chaussier, Mad. Boivin, and M. Dugès thought it was only necessary for the spermatic fluid to be deposited at the entrance of the vagina, so that, by absorption, it might be taken into the circulation and then be brought back through the blood-vessels to the ovary, where the fecundation occurred. This hypothesis would, indeed, explain all the anomalies; but it is not founded on a single anatomical fact, nor yet upon any direct experiment, and further, it is at variance with the researches of modern ovologists; so of course I shall not dwell further upon it.

Perhaps comparative anatomy might throw some light on the question before us: thus, in certain mammalia, such as the hog, cow, etc., the Fallopian tube is not the only canal that affords a passage to the sperm; for M. Gartner, of Copenhagen, has announced the existence of a particular duct in these animals, which extends from the external parts through the substance of the broad ligaments. In 1826 he came to Paris, and, conjointly with M. de Blainville, made some new researches on this point, the results of which the French naturalist has communicated to the public in the *Bulletin de la Société Philomatique*, t. 9, p. 109, 1826. The latter says, that if the vagina of a young sow be carefully examined, a particular canal will be discovered, having its external orifices on each side of the meatus urinarius, and running through the muscular fibres of the

It is evident that no operation could be attempted in the earlier months of pregnancy, even if we should be fortunate enough to ascertain with certainty that the ovule was not developed in the uterus.

It is my opinion, however, that frequent copious bleedings should be resorted to in such cases, for the double purpose of causing the death of the fœtus and of preventing (possibly) a congestion, or rather too great a determination of blood towards the point at which the ovum is being developed.

Indeed, it seems clear to me, that not only does the constantly increasing weakness of the walls of the cyst, but also the local congestions so common during pregnancy, contribute to render rupture of the cyst more frequent.

Venesection, practised within the limits authorized by the general health of the patient, will be the more indicated here, as its unfavorable influence on the child's life is not to be dreaded, since its death is the most fortunate event that could occur. Might this latter result be obtained by passing electric shocks through the cyst? Still, if no obstacle can be opposed to the constant development of the fœtus, every operation must be proscribed at this period for extracting the fœtus from its mother's body, because an operation would be as dangerous as the anticipated accident. Even when the spontaneous rupture of the cyst, during the early stages, occasions a just fear of mortal hemorrhage, we can only employ those general means which are the best calculated to prevent profuse discharges, such as rest, refrigerants, etc. Again, supposing that a well-marked case of extra-uterine pregnancy has advanced almost to term, or that the labor has actually commenced, we may still justly dread the laceration of the cyst as a consequence of the expulsive efforts; and the question then arises whether gastrotomy, which has been successfully practised in similar cases, ought to be resorted to. If the child's safety be alone considered, this question is easily resolved. But is not the life of the mother almost necessarily compromised by such an operation?

How shall we persuade the patient, when the proper period for operating has arrived, if she herself does not suspect the danger she encounters by refusing? Or how, indeed, can we ourselves decide, when the possible consequences are foreseen, the whole difficulties of a delivery appreciated, and the necessity staring us in the face of leaving open in the abdomen a vast cyst, the inflammation and suppuration of which are so difficult to dry up, and are of themselves sufficient to endanger the sufferer's life?

In such cases who can doubt, says M. Dezeimeris, that if there was any measure at all that could suspend the commencing labor, the ties of humanity alone would render its employment a duty? And I fully embrace the same opinion.

Now among the means calculated to restrain the ordinary uterine contractions I know of nothing more serviceable than opium, when exhibited in large doses, per anum, and I certainly should not hesitate to employ it under these circumstances; but if the labor continues, notwithstanding its use, gastrotomy may then be authorized.

The cyst is generally opened through the abdominal parietes, the place of selection being the same as in the common Cæsarean operation, though, in case the head be felt through the vagina during the expulsive efforts, less danger would certainly accompany an incision through the walls of the latter. The child may be extracted by turning, or by the forceps, if necessary. In two cases, one of which is attributed to Lauverjat, both mother and child were saved by an operation of the kind. In three other cases, collected by Burns, the child was extracted alive, but the mother perished.

Finally, it is evident that if a prolonged labor has produced a rupture of the cyst, it is very doubtful whether gastrotomy could be successful.

The first efforts should be directed towards moderating the hemorrhage, and when the first dangers have been removed, every means of preventing and opposing consecutive inflammation should be energetically employed.

But the primitive phenomena once calmed, whether there be a rupture or not, our art may evidently interpose to prevent the consecutive accidents that have been enumerated, and which compromise to so great an extent the health and even the life of the patient. When the inflammatory symptoms have ceased, it is proper to wait; and especially after the cyst is ruptured hasty action becomes unnecessary.

In fact, a considerable period is requisite in such cases for the development of a new cyst around the displaced parts, and a certain length of time is necessary for the adhesions to form between them and the adjacent parts, and it would be exceedingly rash to interfere with this salutary action by any inopportune operation on our part. In old abnormal pregnancies the resources of art vary with the particular case. Sometimes, indeed, an eliminatory effort has already commenced by an inflammation of the integuments placed just in front of the tumor, whereby an abscess is formed; and the only question then is, whether to open it, or by suitable incisions to enlarge the spontaneous solutions of continuity; in either case we encounter a vast abscess, which must be emptied and cleansed by the usual methods.

When some portions of the fœtus get into the bladder, and we are assured of that fact by the use of the catheter, the operation for stone may be practised either through the vagina or by the hypogastrium. Again, a woman may present herself with an extra uterine fœtus of one or several years' standing. Can the resources of art afford her any relief? We reply, that if the gestation is a

vagina; it becomes contracted near the neck of the uterus, but does not the less continue in the uterine tissue. This canal at first follows the body of the womb, then abandons it, and runs in the substance of the broad ligament parallel to the corresponding cornua and close to the origin of the Fallopian tube, where it is lost by seeming to spread out, or to subdivide into two or three filaments, which can scarcely be distinguished from the vessels, and more especially from the proper tissue of the broad ligament.

M. de Blainville says he has searched in vain for similar canals in women, but he has not met with anything of the kind. Analogy, however, renders their existence probable in the human species; and this probability becomes still stronger from the account of a case communicated by M. Baudelocque to the Académié de Médécine (*Arch. de Méd.* 1826), as a unique anomaly in the science; although it is a very singular fact that Dulaurens, according to the report of Mauriceau (*Traité des Maladies des Femmes Grosses*, p. 12, t. 1), had several times observed that the tube, after arriving at the angle of the uterus, separated into two distinct canals, the larger and shorter of which was inserted in the fundus uteri, while the other, being narrower and longer, terminated at the neck, near its internal orifice.

De Graaf (*Opera Omnia*, p. 212) thought he had found canals in women, similar to those described by M. Gartner as existing in certain mammalia.

Lastly, Mad. Boivin declares she has met with cases analogous to the bifurcated canal of M. Baudelocque. Hence, in these examples at least, there is good ground for supposing that a conception may occur, even when the internal orifice of the tube is wholly obliterated.

Now if, as Mauriceau and Dulaurens say (whose researches the modern authors seem to have entirely overlooked), such anomalies were found at a period when dissections were much more rare than at the present time, we may conclude that, if the writers of our own day have not realized that disposition, it is because their efforts are not directed to the same end.

I shall close these remarks by bringing forward a case, reported by M. Reynauld, in the second volume of the *Journal Hebdomadaire*, An. 1829, as follows: A young woman, age 21 years, died at La Charité in consequence of a vertebral caries. At the autopsy, the uterus was found as large as the pregnant organ at six weeks, and its enlarged cavity was occupied by a false membrane having just the same shape, but in which no opening was discovered. The adhesions to the walls were easily broken up, and three or four ounces of a yellowish liquid were found inclosed within. No trace of the internal orifice of the tubes existed, and they were equally obliterated at the free extremity. The long diameter of the ovaries exceeded an inch in length, and their surfaces exhibited evident traces of numerous cicatrices. Both of them contained in their interior a rounded body of a brownish-red color (a true corpus luteum), and small fibrous pouches were detected in several places, with wrinkled and retracted walls. Numerous little ovoidal bodies, about the size of hemp-seed, resembling the ovules, existed along the course of the tubes and in the thickness of the broad ligament.

It was very remarkable in this case that, notwithstanding a complete obliteration of the tubes, the organs of generation were found in a condition similar to what is observed at the commencement of the generative action. However, I shall deduct no direct conclusion therefrom; but I would ask your attention to the confirmation it affords of the ideas promulgated in this report (Report of M Cazeaux, extracted from the *Bulletin de la Société Anatomique*).

source of severe suffering, and it renders her incapable of discharging her duties; and if, besides, the tumor may be reached through the vagina without difficulty, the vaginal incision should doubtless be performed. But if she is otherwise in good health, would it be prudent to interfere for the mere purpose of anticipating the accidents to which she will probably be afterwards exposed? Or is there any ground for hoping to extract the fœtus *en masse*, by a prudent and methodical operation? This last question is far more difficult to solve. In a case of this kind, where the head of the fœtus, from being wedged at the superior strait, could readily be felt through the posterior superior part of the vaginal parietes, I knew Professor P. Dubois (notwithstanding sharp opposition from several of his brethren in consultation) to resolve upon incising freely the vaginal wall, as well as the cystic envelopes, intending to apply the forceps on the head, and thus extract the fœtus bodily; but the walls of the cyst and vagina having been cut through, an intimate adhesion was discovered between the former and the fœtal head, which caused the operation to be abandoned. It was not without benefit, however, for in the course of a few days it was followed by the discharge of a putrid mass, comprising all the soft parts of the fœtus; the detached bones of the skeleton were gradually extracted by the aid of long pincers, and frequently repeated injections; the cystic walls contracted slowly; and when at length nothing remained, and the parietes were cleansed, the opening gradually closed up, and by the end of two months the patient was completely cured. At the time of operating she had been pregnant twenty-two months.

This plan, I think, ought to be followed up in similar cases, more especially if the female's health is visibly affected.

Incision by the rectum has been practised in some few instances where the vulva was obliterated.

Finally, gastrotomy alone would be practicable when the fœtus, from its high situation in the abdomen, is inaccessible by the vagina or rectum; but this operation must be regarded as the last resource, and only to be resorted to where the patient's life is seriously endangered.

CHAPTER XV.

LABOR.—*PLAYFAIR.*

SECTION I.

THE PHENOMENA OF LABOR.

Delivery at Term.—In considering delivery at term we have to discuss two distinct classes of events.

One of these is the series of vital actions brought into play in order to effect the expulsion of the child; and the other consists of the movements imparted to the child—the body to be expelled—in other words, the mechanism of delivery.

Causes of Labor.—Before proceeding to the consideration of these important topics, a few words may be said as to the determining causes of labor. This subject has been from the earliest times a *quæstio vexata* among physiologists; and many and various are the theories which have been broached to explain the curious fact that labor spontaneously commences, if not at a fixed epoch, at any rate approximately so. It must be admitted that even yet there is no explanation which can be implicitly accepted.

Fœtal or Maternal Causes.—The explanations which have been given may be divided into two classes—those which attribute the advent of labor to the fœtus, and those which refer it to some change connected with the maternal generative organs.

The former is the opinion which was held by the older accoucheurs, who assigned to the fœtus some active influence in effecting its own expulsion. It need hardly be said that such fanciful views have no kind of physiological basis. Others have supposed that there might be some change in the placental circulation, or in the vascular system of the fœtus, which might solve the mystery. The latest hypothesis of this kind, which, however, is not fortified by any evidence, is by Barnes, who says: "I rather incline to the opinion that when the fœtus has attained its full development, when its organs are prepared for external life, some change takes place in its circulation, which involves a correlative disturbance in the maternal circulation, which excites the attempt at labor."*

The majority of obstetricians, however, refer the advent of labor to purely maternal causes. Among the more favorite theories is one, which was originally started in this country by Dr. Power, and adopted and illustrated by Depaul, Dubois, and other writers. It is based on the assumption that there is a sphincter action of the fibres of the cervix, analogous to that of the sphincters of the bladder and rectum, and that when the cervix is taken up into the general uterine cavity as pregnancy advances, the ovum presses upon it, irritates its nerves, and so sets up reflex action, which ends in the establishment of uterine contraction. This theory was founded on erroneous conceptions of the changes that occurred in the neck of the uterus; and, as it is certain that obliteration of the cervix does not really take place in the manner that Power believed when his theory was broached, it is obvious that its supposed result cannot follow.

Distension of the Uterus.—Extreme distension of the uterus has been held to be the determining cause of labor, a view lately revived by Dr. King, of Washington,† who believes that contractions are induced because the uterus ceases to augment in capacity, while its contents still continue to increase. This hypothesis is sufficiently disproved by a number of clinical facts which show that the uterus may be subject to excessive and even rapid distension—as in cases of hydramnios, multiple pregnancy, and hydatiform degeneration of the ovum—without the supervention of uterine contractions.

Fatty Degeneration of the Decidua.—Another inciter of uterine action has been supposed to be the separation of the ovum from its connections to the uterine parietes, in consequence of fatty degeneration of the decidua occurring at the end of pregnancy. The supposed result of this change, which undoubtedly occurs, is that the ovum becomes so detached from its organic adhesions as to be somewhat in the position of a foreign body, and thus incites the nerves so largely distributed over the interior of the uterus. This theory, which has been widely accepted, was originally started by Sir James Simpson, who pointed out that some of the most efficient means of inducing labor (such, for example, as the insertion of a gum-elastic catheter between the ovum and the uterine walls) probably act in the same way, viz., by effecting separation of the membranes and detachment of the ovum.

Barnes instances, in opposition to this idea, the fact that ineffectual attempts at labor come on at the natural term of gestation in cases of extra-uterine pregnancy, when the fœtus is altogether

* Diseases of Women, p. 434.

† American Journal of Obstetrics, vol. iii.

independent of the uterus, and therefore, he argues, the cause cannot be situated in the uterus itself. A fair answer to this argument would be that although, in such cases, the womb does not contain the ovum, it does contain a decidua, the degeneration and separation of which might suffice to induce the abortive and partial attempts at labor then witnessed.

Objections to these Theories.—A serious objection to all these theories, which are based on the assumption that some local irritation brings on contraction, is the fact, which has not been generally appreciated, that uterine contractions are always present during pregnancy as a normal occurrence, and that they may be, and often are, readily intensified at any time, so as to result in premature delivery.

It is, indeed, most likely that, at or about the full term, the nervous supply of the uterus is so highly developed, and in so advanced a state of irritability, that it more readily responds to stimuli than at other times. If by separation of the decidua, or in some other way, stimulation of the excitor nerves is then effected, more frequent and forcible contractions than usual may result, and, as they become stronger and more regular, terminate in labor. But, allowing this, it still remains quite unexplained why this should occur with such regularity at a definite time.

Tyler Smith's Ovarian Theory.—Tyler Smith tried, indeed, to prove that labor came on naturally at what would have been a menstrual epoch, the congestion attending the menstrual nisus acting as the exciter of uterine contraction. He, therefore, refers the onset of labor to ovarian, rather than to uterine, causes. Although this view is upheld with all its author's great talent, there are several objections to it difficult to overcome. Thus, it assumes that the periodic changes in the ovary continue during pregnancy, of which there is no proof. Indeed there is good reason to believe that ovulation is suspended during gestation, and with it, of course, the menstrual nisus. Besides, as has been well objected by Cazeaux, even if this theory were admitted, it would still leave the mystery unsolved, for it would not explain why the menstrual nisus should act in this way at the tenth menstrual epoch, rather than at the ninth or eleventh.

In spite then of the many theories at our disposal, it is to be feared that we must admit ourselves to be still in entire ignorance of the reason why labor should come on at a fixed epoch.

Mode in which the Expulsion of the Child is Effected.—The expulsion of the child is effected by the contractions of the muscular fibres of the uterus, aided by those of some of the abdominal muscles. These efforts are in the main entirely independent of volition. So far as regards the uterine contractions, this is absolutely true, for the mother has no power of originating, lessening, or increasing the action of the uterus. As regards the abdominal muscles, however, the mother is certainly able to bring them into action, and to increase their power by voluntary efforts; but, as labor advances, and as the head passes into the vagina and irritates the nerves supplying it, the abdominal muscles are often stimulated to contract, through the influence of reflex action, independently of volition on the part of the mother.

The Chief Factor in Expulsion.—There can be little doubt that the chief agent in the expulsion of the child is the contraction of the uterus itself. This opinion is almost unanimously held by accoucheurs, and the influence of the abdominal muscles is believed to be purely accessory. Dr. Haughton, however, maintains a view which is directly contrary to this. From an examination of the force of the uterine contractions, arrived at by measuring the amount of muscular fibre contained in the walls of the uterus, he arrives at the conclusion that the uterine contractions are chiefly influential in rupturing the membranes and dilating the os uteri, bringing into action, if needful, a force equivalent to 54 lbs.; but when this is effected, and the second stage of labor has commenced, he thinks the remainder of the labor is mainly completed by the contractions of the abdominal muscles, to which he attributes enormous powers, equivalent, if needful, to a pressure of 523.65 lbs. on the area of the pelvic canal.

These views bear on a topic of primary consequence in the physiology of labor. They have been fully criticized by Duncan, who has devoted much experimental research to the study of the powers brought into action in the expulsion of the child. His conclusions are that, so far from the enormous force being employed that Haughton estimated, in the large majority of cases the effective force brought to bear on the child by the combined action of both the uterine and abdominal muscles is less than 50 lbs.—that is, less than the force which Haughton attributed to the uterus alone. In extremely severe labors, when the resistance is excessive, he thinks that extra power may be employed; but he estimates the maximum as not above 80 lbs., including in this total the action of both the uterine and abdominal muscles. Joulin arrived at the conclusion that the uterine contractions were capable of resisting a maximum force of about one hundred weight. Both these estimates, it will be observed, are much under that of Haughton, which Duncan describes as representing "a strain to which the maternal machinery could not be subjected without instantaneous and utter destruction."

There are many facts in the history of parturition which make it certain that the chief factor in the expulsion of the child is the uterus. Among these may be mentioned occasional cases in which the action of the abdominal muscles is materially lessened, if not annulled—as in profound anæsthesia, and in some cases of paraplegia—in which, nevertheless, uterine contractions suffice to effect delivery. The most familiar example of its influence, however, and one that is a matter of everyday observation in practice, is when inertia of the uterus exists. In such cases no effort on the part of the mother, no amount of voluntary action that she can bring to bear on the child, has any appreciable influence on the progress of the labor, which remains in abeyance until the defective uterine action is re-established, or until artificial aid is given.

The contraction of the uterus, then, being the main agent in delivery, it is important for us to appreciate its mode of action, and its effect on the ovum.

Uterine Contractions at the Commencement of Labor.—We have seen that intermittent and generally painless uterine contractions exist during pregnancy. As the period for delivery approaches, these become more frequent and intense, until labor actually commences, when they begin to be sufficiently developed to effect the opening up of the os uteri, with the view to the passage of the child. They are now accompanied by pain, which increases as labor advances, and is so characteristic that "pains" are universally used as a descriptive term for the contractions themselves. It does not necessarily follow that uterine contractions are painless until they commence to effect dilatation of the os uteri. On the contrary, during the last days or even weeks of pregnancy, women constantly have irregular contractions, accompanied by severe suffering, which, however, pass off without producing any marked effect on the cervix. When labor has actually begun, if the hand is placed on the uterus, when a pain commences, the contraction of its muscular tissue is very apparent, and the whole organ is observed to become tense and hard, the rigidity increasing until the pain has reached its acme, the uterine walls then relaxing, and remaining soft until the next pain comes on. At the commencement of labor these pains are few, separated from each other by a considerable interval, and of short duration. In a perfectly typical labor the interval between the pains becomes shorter and shorter, while, at the same time, the duration of each pain is increased. At first they may occur only once in an hour or more, while eventually there may not be more than a few minutes' interval between them.

Mode in which Dilatation of the Cervix is Effected.—If, when the pains are fairly established, a vaginal examination be made, the os uteri will be found to be thinned and dilated in proportion to the progress of the labor. During the contraction the bag of membranes will be felt to bulge, to become tense from the downward pressure of the liquor amnii within it, and to protrude

through the os if it be sufficiently open. The membranes, with the contained liquor amnii, thus form a fluid wedge, which has a most important influence in dilating the os uteri. This does not, however, form the sole mechanism by which the os uteri is dilated, for it is also acted upon by the contractions of the muscular fibres of the uterus, which tend to pull it open. It is probable that the muscular dilatation of the os is effected chiefly by the longitudinal fibres, which, as they shorten, act upon the os uteri, the part where there is least resistance.

Partly then by muscular contraction, partly by mechanical pressure, the cervical canal is dilated, and as it opens up it becomes thinner and thinner, until it is entirely taken up into the uterine cavity.

Rupture of the Membranes.—There is no longer any obstacle to the passage of the presenting part of the child into the cavity of the pelvis, and the force of the pains now generally effects the rupture of the membranes, and the escape of the liquor amnii. There is often observed, at this time, a temporary relaxation in the frequency of the pains, which had been steadily increasing; but they soon recommence with increased vigor. If the abdomen be now examined it will be observed to be much diminished in size, partly in consequence of the escape of the liquor amnii, partly from the descent of the fœtus into the pelvic cavity.

Change in the Character of the Pains.—The character of the pains soon changes. They become stronger, longer in duration, separated by a shorter interval, and accompanied by a distinct forcing effort, being generally described as "the bearing-down" pains. Now is the time at which the accessory muscles of parturition come into operation. The patient brings them into play in the manner which will be subsequently described, and the combined action of the uterine and abdominal muscles continues until the expulsion of the child is effected.

Mode of Action of the Uterus.—The precise mode of uterine contraction is still somewhat a matter of dispute. It is generally described as commencing in the cervix, passing gradually upwards by peristaltic action, the wave then returning downwards towards the os uteri. This view was maintained by Wigand, and has been endorsed by Rigby, Tyler Smith, and many other writers. In support of it they instance the fact that, on the accession of a pain, the presenting part first recedes, the bag of membranes then becomes tense and protrudes through the os, and it is not until some time that the presenting part of the child itself is pushed down. It is very doubtful if this view is correct; and a careful examination of the course of the pains would rather lead to the belief that the contractions commence at the fundus, where the muscular tissue is most largely developed, and gradually proceed downwards to the cervix; the waves of contraction being, however, so rapid that the whole organ seems to harden *en masse*. The apparent recession of the presenting part, and the bulging of the bag of membranes, are certainly no proof that the contractions begin at the cervix; for the commencing contraction would necessarily push down the fluid in front of the head, and cause the membranes to bulge, and the os to become tense, before its force was brought to bear on the fœtus itself. Indeed did the contraction commence at the lower part of the uterus, we should expect the opposite of what takes place to occur, and the waters to be pushed upwards, and away from the cervix. The fundal origin of the contraction is further illustrated by what is observed when the hand of the accoucheur is placed in the uterine cavity, as often happens in certain cases of hemorrhage or turning; for if a pain then comes on, it will be felt to start at the fundus, and gradually compress the hand from above downwards.

Value of the Intermittent Character of the Pains.—The intermittent character of the contractions is of great practical importance. Were they continuous, not only would the muscular powers of the patient be rapidly exhausted, but, by the obliteration of the vessels produced by the muscular contraction, the circulation through the placenta would be interfered with, and the life of the child imperilled. Hence one of the chief dangers of protracted labor, especially after the escape of the liquor amnii, is that the uterine fibres may enter into a state of tonic rigidity, a condition that cannot be long continued without serious risks both to the mother and child.

The fact that the uterine contractions are altogether involuntary proves them to be excited—as indeed we would *à priori* infer from our knowledge of the anatomical arrangement of the nerves of the uterus—solely by the sympathetic system. Still it is a fact of everyday observation that they can be largely influenced by emotions. Various stimuli applied to the spinal system of nerves (as for example when the mammæ are irritated) have also a marked effect in inducing uterine contraction. The precise mode in which such influence is conveyed to the uterus, in spite of the numerous experiments which have been made for the purpose of determining how far labor is affected by destruction of the spinal cord, is still a matter of doubt. After the fœtus has passed through the cervix, the spinal nerves distributed to the vagina and perineum are excited by the pressure of the presenting part, and through them the accessory powers of parturition are chiefly brought into play. The contraction of the muscles of the vagina itself is supposed to have some influence in favoring the expulsion of the fœtus after the birth of part of the body, and also in promoting the expulsion of the placenta. In the lower animals the vagina has a very marked contractile property, and is, in some of them, the main agent by which the young are expelled. In the human subject this influence is certainly of very secondary importance.

Character and Source of Pains during Labor.—The amount of suffering experienced during labor varies much in different cases, and is in direct proportion to the nervous susceptibility of the patient. There are some women who go through labor with little or no pain at all. This is proved by the cases (of which there are numerous authentic instances recorded) in which labor has commenced during sleep, and the child has been actually born without the mother awaking. I am acquainted with a lady, who has had a large family, who assures me that, though the labor is accompanied by a sense of pressure and discomfort, she experiences nothing which can be called actual pain. Such a happy state of affairs is, however, extremely exceptional, and, in the vast majority of cases, parturition is accompanied by intense suffering during its whole course, in some cases amounting to anguish, which has probably no parallel under any other condition.

The precise cause of the pain has been much discussed, and is, no doubt, complex.

In the First Stage.—In the early stage of labor, and before the dilatation of the os, it is chiefly seated in the back, from whence it shoots round the loins and down the thighs. It is then probably produced, partly by pressure on the nerve filaments caused by contraction of the muscular fibres to which they are distributed, and partly by stretching and dilatation of the muscular tissue of the cervix. M. Beau believes that in this stage the pain is not produced, strictly speaking, in the uterus itself, but is rather a neuralgia of the lumbo-abdominal nerves. The pains at this time are generally described as "acute" and "grinding," terms which sufficiently well express their nature. In highly nervous women these pains are often much less well borne than those of a later stage, and the suffering they undergo is indicated by their extreme restlessness and loud cries as each contraction supervenes. As the os dilates, and the labor advances into the expulsive stage, other sources of suffering are added.

In the Second Stage.—The presenting part now passes into the vagina and presses on the vaginal nerves, as well as on the large nervous plexuses lying in the pelvis. As it descends lower it stretches the perineum and vulva, and presses on the bladder and rectum. Hence cramps are produced in the muscles supplied by the nerve plexuses, as well as an intolerable sense of tearing and stretching in the vulva and perineum, and often a distressing feeling of tenesmus in the bowels. By this time the accessory muscles of parturition are brought into action, and they, as well as the uterine muscles, are thrown into frequent and violent contractions, which, independently of the other causes mentioned, are sufficient of themselves to produce great pain, likened to that of colic, pro-

duced by involuntary and repeated contraction of the muscles of the intestines.

Taking all these causes into consideration, there is no lack of sufficient explanation of the intolerable suffering which is so constant an accompaniment of child-birth.

Effect of the Pains on the Mother and Fœtus.—The effect of the pains on the mother's circulation is well marked. The rapidity of the pulse increases distinctly with each contraction, and, as the pain passes off, it again declines to its former state. A similar observation has been made with regard to the sounds of the fœtal heart, especially after the expulsion of the liquor amnii. Hicks has pointed out that during a pain the muscular vibrations give rise to a sound which often resembles that of the fœtal heart, and which completely disappears when the muscular tissue relaxes. The effect of the pain in intensifying the uterine souffle has been already mentioned. The strong muscular efforts would naturally lead us to expect a marked elevation of temperature during labor. Further observations on this point are required; but Squire asserts that there is generally only a very slight increase in temperature during delivery, rapidly passing off as soon as labor is over.

Division of Labor into Stages.—Such being the physiological facts in connection with the labor pains, we may now describe the ordinary progress of a natural labor—that is, one terminated by the natural powers, and with a head presenting.

For facility of description obstetricians have long been in the habit of dividing the course of labor into *stages*, which correspond pretty accurately with the natural sequence of events. For this purpose we generally talk of three stages: viz., 1, from the commencement of regular pains until the complete dilatation of the cervix; 2, from the complete dilatation of the cervix until the expulsion of the child; 3, the concluding stage, comprising the permanent contraction of the uterus, and the separation and expulsion of the placenta. To these we may conveniently add a preparatory stage, antecedent to the regular commencement of the labor.

Preparatory Stage.—For a short time before delivery, varying from a few days to a week or two, certain premonitory symptoms generally exist, which indicate the approaching advent of labor. Sometimes they are well marked, and cannot be mistaken; at others they are so slight as to escape observation. Amongst the most common is a sinking of the uterus into the pelvic cavity, resulting from the relaxation of the soft parts preceding delivery. The result is, that the upper edge of the uterine tumor is less high than before, and, in consequence, the pressure on the respiratory organs is diminished, and the woman often feels lighter, and altogether less unwieldy, than in the previous weeks. If a vaginal examination be made at this time, the lower segment of the uterus will be found to have sunk lower into the pelvic cavity; and the consequence of this is that, while the respiration is less embarrassed, and the patient feels less bulky, other accompaniments of pregnancy, such as hemorrhoids, irritability of the bladder and bowels, and œdema of the limbs, become aggravated. The increased pressure on the bowels often induces a sort of temporary diarrhœa, which is so far advantageous that it empties the bowels of feces which may have collected within them. As has already been pointed out, the contractions which have been going on at intervals during the latter months of pregnancy now get more and more marked, and they have the effect of producing a real shortening of the cervix, which is of great value preparatory to its dilatation. More marked mucous discharge from the cavity of the cervix also generally occurs a short time before labor, and it is not infrequently tinged with blood from the laceration of minute capillary vessels. This discharge, popularly known as the "*shows*," is a pretty sure sign that labor is not far off. It may, however, be entirely absent, even until the birth of the child. When copious it serves to lubricate the passages, and is generally coincident with rapid dilatation of the parts, and a speedy labor.

False Pains.—During this time (premonitory stage) painful uterine contractions are often present, which, however, have no effect in dilating the cervix. In some cases they are frequent and severe, and are very apt to be mistaken for the commencement of real labor. Such "*false pains*," as they are termed, are often excited and kept up by local irritations, such as a loaded or disordered state of the intestinal canal; and they frequently give rise to considerable distress, and much inconvenience both to the patient and practitioner. They are, it should be remembered, only the normal contractions of the uterus, intensified and accompanied with pain.

First Stage, or Dilatation.—As labor actually commences, the uterine contractions become stronger, and the fact that they are "*true*" pains can be ascertained by their effect on the cervix. If a vaginal examination be made during one of these, the membranes will be felt to become tense and bulging during the pain, and the os uteri will be found partially dilated, and thinned at its edges. As labor advances this effect on the os becomes more and more marked. At first the dilatation is very slight, perhaps not more than enough to admit the tip of the examining finger, and both the upper and lower orifices of the cervix can be made out. As the pains get stronger and more frequent, dilatation proceeds in the way already described, and the cervix gets more thin and tense, until we can feel a thin circular ring (which is lax between the pains, but becomes rigid and tense during the contraction when the bag of water bulges through it), without any distinction between the upper and lower orifices. During this time the patient, although she may be suffering acutely, is generally able to sit up and walk about. The amount of pain experienced varies much according to the character of the patient. In emotional women of highly-developed nervous susceptibilities it is generally very great. They are restless, irritable, and desponding, and when the pain comes on cry out loudly. The character of the cry is peculiar and well marked during the first stage, and has constantly been described by obstetric writers as characteristic. It is acute and high, and is certainly very different from the deep groans of the second stage, when the breath is involuntarily retained to assist the parturient effort. When dilatation is nearly completed, various reflex nervous phenomena often show themselves. One of these is nausea and vomiting, another is uncontrollable shivering, which is not accompanied by a sense of coldness, the patient being often hot and perspiring. Both these symptoms indicate that the propulsive stage will shortly commence; and they may be regarded as favorable rather than otherwise, although they are apt to alarm the patient and her friends. By this time the os is fully dilated, the membranes generally rupture spontaneously, and a considerable portion of the liquor amnii flows away. The head, if presenting, often acts as a sort of ball-valve, and, falling down on the aperture of the cervix, prevents the complete evacuation of the liquor amnii, which escapes by degrees during the rest of the labor, or may be retained in considerable quantity until the birth of the child.

It not infrequently happens, if the membranes are somewhat tougher than usual, and the pains frequent and strong, that the fœtus is pushed through the pelvis, and even expelled, surrounded by the membranes. When this occurs the child is said to be born with a "*caul*," and this event would doubtless happen more frequently than it does, were it not the custom of the accoucheur to rupture the membranes artificially as soon as the os is completely opened up, after which time their integrity is no longer of any value.

[Just here let me say that it is an unfortunate fact that the accoucheur, in his haste to be through with the case, does not always wait until the os is fully dilated before rupturing the membranes, and to this, more than any other cause, is due the very frequent laceration of the os uteri.—G.]

Second Stage, or Propulsion.—The os is now entirely retracted over the presenting part, and is no longer to be felt, the vagina and the uterine cavity forming a single canal. Now the mucous discharge is generally abundant, so that the examining finger brings away long strings of glairy transparent mucus, tinged with blood. The pains, after a short interval of rest, become entirely altered in character. The uterus contracts tightly round the fœtus, the pre-

senting part descends into the pelvis, and the true propulsive pains commence. The accessory muscles of parturition now come into play. With each pain the patient takes a deep inspiration, and thus fills the chest, so as to give a *point d'appui* to the abdominal muscles. For the same reason she involuntarily seizes hold of some point of support, as the hand of a bystander or a towel tied to the bed, and, at the same time, pushes with her feet against the end of the bed, and so is able to bear down to advantage. The cries are no longer sharp and loud, but consist of a series of deep suppressed groans, which correspond to a succession of short expirations made during the straining effort. In this way the abdominal muscles contract forcibly on the uterus, which they further stimulate to action by pressing upon it. It is to be observed that these straining efforts are, to a considerable extent, under the control of the patient. By encouraging her to hold her breath and bear down they can be intensified; while if we wish to lessen them we can advise her to call out, and when she does so the abdominal muscles have no longer a fixed point of action. Although the patient may thus lessen the effect of these accessory muscles, it is entirely out of her power to stop their action altogether. As labor advances the head descends lower and lower, receding somewhat in the intervals between the pains, until eventually it comes down in the perineum, which it soon distends.

Distension of the Perineum and Birth of the Child.—The pains now get stronger and more frequent, often with scarcely a perceptible interval between them, until the perineum gets stretched by the advancing head. In the interval between the pains elasticity of the perineal structures pushes the head upwards, so as to diminish the tension to which the perineum is subjected, the next pain again putting it on the stretch, and protruding the head a little further than before. By this alternate advance and recession, the gradual yielding of the structures is favored, and risk of laceration greatly diminished. During this time the pressure of the head mechanically empties the bowel of its contents. During the last pains, when the perineum is stretched to the utmost, the anal aperture is dilated, sometimes to the size of a five-shilling piece; and in this way the perineum is relaxed, just as the distension, and consequent risk of laceration, are at their maximum. The apex of the head now protrudes more and more through the vulva, surrounded by the orifice of the vagina, and eventually it glides over the perineum and is expelled. The intensity of the suffering at this moment generally causes the patient to call out loudly. The force of the abdominal muscles is thus lessened at the last moment, and this, in combination with the relaxation of the sphincter ani, forms an admirable contrivance for lessening the risk of perineal injury. The rest of the body is generally expelled immediately by a single pain, and with it are discharged the remains of the liquor amnii, and some blood-clots from separation of the placenta; and so the second stage of labor terminates.

The Third Stage. Its Importance.—The third stage commences after the expulsion of the child. It is of paramount importance to the safety of the mother that it should be conducted in a natural and efficient manner; for it is now that the uterine sinuses are closed, and the frail barrier by which nature effects this may be very readily interfered with, and serious and even fatal loss of blood ensue. Unfortunately, it is too often the case that the practitioner's entire attention is fixed on the expulsion of the child, so that the natural history of the rest of delivery is very generally imperfectly studied and understood.

Contraction of the Uterus and Detachment of the Placenta.—As soon as the child is expelled the uterine fibres contract in all directions, and the hand, following the uterus down, will find that it forms a firm rounded mass lying in the lower part of the abdominal cavity. By retraction of its internal surface, the placental attachments are generally separated, and the after-birth remains in the cavity of the uterus as a foreign body.

Mode in which Hemorrhage is Prevented.—The escape of blood from the open mouths of the uterine sinuses is now prevented in two ways; viz., (1) by the contraction of the uterine walls, and the more firm, persistent and tonic this is, the more certain is the immunity from hemorrhage; (2) by the formation of coagula in the mouths of the vessels. Any undue haste in promoting the expulsion of the placenta tends to prevent the latter of these two hemostatic safeguards, and is apt to be followed by loss of blood. After a certain time, averaging from a quarter to half an hour, the uterus will be felt to harden, and, if the case be solely left to nature, what has been aptly called a miniature labor occurs. Pains come on, and the placenta is spontaneously expelled from the uterus, either into the canal of the vagina, or even externally. In most obstetric works it is stated that the after-birth may be separated either from its centre or edge, and that it is very generally expelled through the os in an inverted form, with its fœtal surface downwards, and folded transversely on itself. That this is the mode in which the placenta is often expelled, when traction on the cord is practised, is a matter of certainty. It then passes through the os very much in the shape of an inverted umbrella. It is certain, however, that this is not the natural mechanism of its delivery. What this is has been well illustrated by Duncan,* who has very clearly shown that, when this stage of labor is left entirely to nature, the separated placenta is expelled edgeways, its uterine and detached surface gliding along the inner surface of the uterus, the foldings of its structure being parallel to the long diameter of the uterine cavity (Fig. 73). In this way it is expelled into the vagina, and during the process little or no hemorrhage occurs. When the placenta is drawn out in the way too generally practised, it obstructs the aperture of the os, and, acting like the piston of a pump, tends to promote hemorrhage. The corollaries as to treatment drawn from these facts will be subsequently considered. I am anxious, however, here to direct attention to nature's mechanism, because I believe there is no part of labor about the management of which erroneous views are more prevalent than that of this stage, and none in which they are more apt to lead to serious consequences; and unless the mode in which nature effects the expulsion of the placenta, and prevents hemorrhage, is thoroughly understood, we shall certainly fail in assisting her in a proper manner. In the large proportion of cases, when left entirely to themselves, the placenta would be retained, if not in the uterus, at any rate in the vagina, for a considerable time—possibly for several hours—and such delay would very unnecessarily tire the patience of the practitioner, and be prejudicial to the patient. It is, therefore, our duty in the majority of cases to promote the expulsion of the after-birth; and when this is properly and scientifically done, we increase rather than diminish the patient's safety and comfort. But, in order to do this, we must assist nature, and not act in opposition to her method, as is so often the case.

Fig. 73.

Mode in which the Placenta is Naturally Expelled. (After Duncan.)

After-pains.—When once the placenta is expelled, the uterus contracts still more firmly, and in a typical case is felt just within the pelvic brim, hard and firm, and about the size of a cricket ball. Generally for several hours, or even for one or two days, it occasionally relaxes and contracts, and these contractions give rise to the "*after-pains*" from which women often suffer much. The object of these pains is, no doubt, to expel any coagula that may remain in the uterus, and therefore, however unpleasant they may be to the patient, they must be considered, unless very excessive, to be salutary rather than otherwise.

Duration of Labor.—The length of labor varies extremely in different cases, and it is quite impossible to lay down any definite rules with regard to it. Subject to exceptions, labor is longer in primiparæ than in multiparæ, on account of the greater resistance

* Edin. Med. Jour., April, 1871

of the soft parts in the former, especially of the structures about the vagina and vulva. It is also generally stated that the difficulty of labor increases with the age of the patient, and that in elderly primiparæ it is likely to be unusually tedious from rigidity of the soft parts. It is very doubtful if this opinion has any real basis, and in such cases the practitioner often finds himself agreeably disappointed on the result. Mr. Roper,* indeed, argues that the wasting of the tissues which occurs after forty years of age diminishes their resistance, and that first labors, after that age, are easier, as a rule, than in early life. The habits and mode of life of patients have, no doubt, a considerable influence on the duration of labor, but we are not in possession of any very reliable facts with regard to this subject. It is reasonable to suppose that the tissues of large, muscular, strongly developed women will offer more resistance than those of slighter build. On the other hand, women of the latter class, especially in the upper ranks of life, more often develop nervous susceptibilities, which may be expected to influence the length of their labors. The average duration of labor, calculated from a large number of cases, is from eight to ten hours; even in primiparæ, however, it is constantly terminated in one or two hours from its commencement, and may be extended to twenty-four hours without any symptoms of urgency arising. In multiparæ it is frequently over in even a shorter time. Indications calling for interference may arise at any time during the progress of labor, independently of its length. The proportion between the length of the first and second stages also varies considerably. The first stage is generally the longest; and it is stated by Cazeaux to be normally about twice the length of the second. This is probably under the mark, and I believe Joulin to be nearer the truth in stating that the first stage should be to the second as four or five to one, rather than as two to one. Often when the first stage has been very prolonged the second is terminated rapidly.

Necessity of Caution in Expressing an Opinion as to the Possible Duration of Labor.—The practitioner is constantly asked as to the probable length of labor, and the uncertainty of this should always lead him to give a most guarded opinion. Even when labor is progressing apparently in the most satisfactory manner, the pains frequently die away, and delivery may be delayed for many hours. In the first stage a cervix that is apparently rigid and unyielding may rapidly and unexpectedly dilate, and delivery soon follow. In either case, if the practitioner has committed himself to a positive opinion he is apt to incur blame, and it is far better always to be extremely cautious in our predictions on this point.

Period of the Day at which Labor Occurs.—A somewhat larger proportion of deliveries occur in the early hours of the morning than at other times. Thus West† found that out of 2,019 deliveries 780 took place from 11 P. M. to 7 A. M., 662 from 7 A. M. to 3 P. M., and 577 from 3 P. M. to 11 P. M.

SECTION II.

MECHANISM OF DELIVERY IN HEAD PRESENTATIONS.

Importance of the Subject.—It is quite impossible to over-estimate the importance of thoroughly understanding the mechanism of the passage of the fœtus through the pelvis. This dominates the whole scientific practice of midwifery, and the practitioner cannot acquire more than a merely empirical knowledge, such as may be possessed by an uneducated midwife, or to conduct the more difficult cases requiring operative interference, with safety to the patient or satisfaction to himself, unless he thoroughly masters the subject.

In treating of the physiological phenomena of labor, it was assumed that we had to do with an ordinary case of head presentation, the description being applicable, with slight variations, to presentations of other parts of the fœtus. So in discussing the mechanical phenomena of delivery, I shall describe more in detail the mechanism of head presentations, reserving any account of the mechanism of other presentations until they are separately studied. Head presentation is so much more frequent than that of any other part—amounting to 95 per cent. of all cases—that this mode of studying the subject is fully justified; and, when once the student has mastered the phenomena of delivery in head presentations, he will have little difficulty in understanding the mechanism of labor when other parts of the fœtus present, based, as it always is, on the same general plan.

Position of the Head by its Sutures and Fontanelles.—In entering on this study we come to appreciate the importance of the sutures and fontanelles in enabling us to detect the position of the fœtal head, and to watch its progress through its canal: and unless the "tactus eruditus" by which these can be distinguished from each other has been acquired, the practitioner will be unable to satisfy himself of the exact progress of the labor. Nor is this always easy. Indeed, it requires considerable experience and practice before it is possible to make out the position of the head with absolute certainty; but this knowledge should always be aimed at, and the student will never regret the time and trouble he spends in acquiring it.

Position of the Head at the Commencement of Labor.—At the commencement of labor the long diameter of the head lies in almost any diameter of the pelvic brim, except in the antero-posterior, where there is not space for it. In the large majority of cases, however, it enters the pelvis in one or other of the oblique diameters, or in one between the oblique and transverse; but until it has fairly passed through the brim it more frequently lies directly in the transverse diameter than has been generally supposed. Hence obstetricians are in the habit of describing the head as lying in four positions, according to the parts of the pelvis to which the occiput points; the first and third positions being those in which the long diameter of the head occupies the right oblique diameter of the pelvis; the second and fourth those in which it lies in the left oblique. Many subdivisions of these positions have been made, which only complicate the subject, and render it more difficult to understand.

The positions, then, of the fœtal head after it has entered the brim, which it is of importance to be able to distinguish in practice, are:—

First (*or left occipito-cotyloid*).—The occiput points to the left foramen ovale; the sinciput to the right sacro-iliac synchondrosis, and the long diameter of the head lies in the right oblique diameter of the pelvis.

Second (*or right occipito-cotyloid.*)—The occiput points to the right foramen ovale, the forehead to the left sacro-iliac synchondrosis, and the long diameter of the head lies in the left oblique diameter of the pelvis.

Third (*or right occipito-sacro-iliac*).—The occiput points to the right sacro-iliac synchondrosis, the forehead to the left foramen ovale, and the long diameter of the head lies in the right oblique diameter of the pelvis. This position is the reverse of the first.

Fourth (*or left occipito-sacro-iliac*).—The occiput points to the left sacro-iliac synchondrosis, the forehead to the right foramen ovale, and the long diameter of the head lies in the left oblique diameter of the pelvis. This position is the reverse of the second.

Frequency of these Positions.—The relative frequency of these positions has long been, and still is, a matter of discussion among obstetricians. According to Naegele, to whose classical essay we owe the greater part of our knowledge of the subject, the head lies in the right oblique diameter in 99 per cent. of all cases. More recent researches have thrown some doubt on the accuracy of these figures, and many modern obstetricians believe that the second position, which Naegele believed only to be observed as a transitional stage in the natural progress of the third position, is much more common than he supposed. This question will be more fully discussed when we treat of the mechanism of occipito-posterior delivery, and, in the meantime, it may serve to show the discrepancy which exists in the opinions of modern writers, if

* Obst. Trans., v. 7. † Amer. Med. Journ., 1854.

we append the following table of the relative frequency of the various positions,* copied from Leishman's work:

	First Position.	Second Position.	Third Position.	Fourth Position.	Not Classified.
Naegele.....	70.	.....	29.	.....	1.
Naegele, Jun..	64.64	.....	32.88	.....	" 2.47
Simpson and Barry ..	76.45	.29	22.68	.58	.....
Dubois.....	70.83	2.87	25.66	.62	.....
Murphy.....	63.23	16.18	16.18	4.42	.....
Swayne	86.36	9.79	1.04	2.8	.....

Here it will be seen that all obstetricians are agreed as to the immensely greater frequency of the first position—the only point at issue being the relative frequency of the second and third.

Explanation.—Various explanations have been given of the greater frequency with which the head lies in the right oblique diameter. By some it is referred to the natural tendency of the back of the fœtus, as shown by the experimental researches of Höning and other writers, to be directed, in consequence of gravitation, forwards and to the left side of the mother in the erect attitude, and backwards and to her right side in the recumbent. The explanation given by Simpson was that the head lay in the right oblique diameter in consequence of the measurement of the left oblique being more or less lessened by the presence of the rectum. When the rectum is collapsed, indeed, the narrowing of the diameter is slight; but it is so often distended by fæcal matter —sometimes, when constipation exists, to a very great extent— that it may really have a very important influence in determining the position of the fœtal head.

In describing the mechanism of delivery, it will be well for us to concentrate our attention on the first, or most common position, dwelling subsequently more briefly on the differences between it and the less common ones.

Description of the First Position.—In this position, when the head commences to descend, the occiput lies in the brim pointing to the left ileo-pectineal eminence, the forehead is directed to the right sacro-iliac synchondrosis, and the sagittal suture runs obliquely across the pelvis in the right-oblique diameter. The back of the child is turning towards the left side of the mother's abdomen, the right shoulder to her right side, the left to her left side. If a vaginal examination be now made (the patient lying in the ordinary obstetric position), and the os be sufficiently open, the finger will impinge upon the protuberance of the right parietal bone, which is described as the "presenting part," a term which has received various definitions, the best of which is probably that adopted by Tyler Smith, viz., "that portion of the fœtal head felt most prominently within the circle of the os uteri, the vagina, and the os tincæ, in the successive stages of labor." If the tip of the examining finger be passed slightly upwards, it will feel the sagittal suture running obliquely across the pelvis, and if this be traced downwards and to the left, it will come upon the triangular posterior fontanelle, with the lambdoidal sutures diverging from it. If the finger could be passed sufficiently high in the opposite direction, upwards and to the right, it would come upon the large anterior fontanelle; but, at this time, that is too high up to be within reach. The chin is slightly flexed upon the sternum, this flexion, as we shall presently see, being greatly decreased as the head begins to descend.

The head, at the commencement of labor, generally lies within the pelvic brim, especially in primiparæ. In multiparæ, owing to the relaxation of the abdominal parietes, the uterus is apt to fall somewhat forwards, and the head consequently is more entirely above the brim, but is pushed within it as soon as labor actually commences.

Naegele's Views.—Naegele—and his description has been adopted by most subsequent writers—describes the head, at this period, as lying obliquely in relation to the brim, the right parietal bone, on which the examining finger impinges, being supposed by him to be much lower than the left. The accuracy of this view has, of late years, been contested, and it is now pretty generally admitted that this obliquity does not exist, and that the head enters the brim of the pelvis with both parietal bones on the same level, and with its bi-parietal diameter parallel to the plane of the inlet. Naegele's view was adopted, partly because the finger always felt the right parietal protuberance lowest, and partly because it was at that point that the "*caput succedaneum*," or swelling observed on the head after delivery, was always formed. Both arguments are, however, fallacious; for the right parietal bone is the part which would naturally be felt lowest, on account of the oblique position of the pelvis to the trunk; while, with regard to the caput succedaneum, it has been conclusively proved by Duncan, that it does not form on the point most exposed to pressure, as Naegele assumed, but on the part of the head where there is least pressure; that is, the part lying over the axis of the vaginal canal.

Division of Mechanical Movements into Stages.—In tracing the progress of the head from the position just described, obstetricians have been in the habit of dividing the movements it undergoes into various stages, which are convenient for the purpose of facilitating description. It must be borne in mind that these are not evident and distinct stages, which can always be made out in practice, but that they run insensibly into one another, and often occur simultaneously, or nearly so, in rapid labor. They may be described as: 1. *Flexion.* 2. *First movement of descent.* 3. *Levelling or adjusting movement.* 4. *Rotation.* 5. *Second movement of descent and extension.* 6. *External rotation.*

1. *Flexion*, the first movement of the head, consists of a rotation on its bi-parietal diameter, by which the chin of the child becomes bent on the sternum, and the occiput descends lower than the front part of the head. By this there is a clear gain of at least a half inch, for the occipito-bregmatic diameter (3½ inches) becomes substituted for the occipito-frontal (4 inches).

The movement is most marked when the pelvis is narrow, and, in some cases of pelvic deformity, it takes place to an extreme degree; while in unusually large and roomy pelves, it occurs to a very slight extent, or not at all. The reason of this flexion is twofold. Solayres and the majority of obstetricians explain it by saying that the expulsive force is communicated to the head through the vertebral column, and, inasmuch as the head is articulated much nearer the occiput than the sinciput, the resistance being equal, the former must be pushed down. This is doubtless the correct explanation of the flexion *after* the membranes are ruptured; but, before that happens, the ovum is practically a bag of water, which is equally compressed at all points by the uterine contractions, and is pushed downwards through the os *en masse*, the expulsive force not being transmitted through the vertiebral column at all. Under such circumstances flexion is probably effected in the following way: the head being articulated nearer the occiput than the forehead, and being equally pressed upon from below by the resisting structures, the pressure is more effectual on the forehead—consequently that is forced upwards, and the occiput descends. This explanation would also hold good after the rupture of the membranes, and probably both causes assist in effecting the movement.

2 and 3. *Descent and Levelling Movement.*—The movements of *descent* and *levelling* may be described together. As soon as the head is liberated from the os uteri, it descends pretty rapidly through the pelvis, until the occiput reaches a point nearly opposite the lower part of the foramen ovale, and the sinciput is opposite the second bone of the sacrum. A levelling movement now occurs, the anterior fontanelle comes to be more easily within reach, more on a level with the posterior, and the chin is no longer so much flexed on the sternum. This change is due to the fact that the anterior end of the ovoid experiences greater resistance than the posterior, and as soon as this resistance counterbalances and exceeds that applied to the latter, the sinciput must descend. The right side of the head also descends more than the left from a similar cause, so that the head becomes, as it were, slightly flexed on the right shoulder. This obliquity of the head on its transverse

*Leishman's System of Widwifery, p. 341.

diameter in the lower part of the pelvis has been denied by Küneke,* who maintains that the head passes through the entire pelvis in the same position as it enters the brim; that is, with both parietal bones on a level, so that the point of intersection of the transverse and antero-posterior diameters of the pelvis would correspond with the sagittal suture. There is, however, good reason to believe that, in the lower half of the pelvic cavity, the head is not truly synclitic, as Küneke describes, but that the right parietal bone is on a somewhat lower level than the left.

4. *Rotation.*—The movement of *rotation* is very important. By it the long diameter of the head is changed from the oblique diameter of the pelvic cavity to the antero-posterior diameter of the outlet, or to a diameter nearly corresponding to it, so that the long diameter of the head is brought into relation with the longest diameter of the pelvic outlet. This alteration almost always takes place, and may be readily observed by the accoucheur who carefully watches the progress of labor. Various explanations have been given of its causes. The one most generally adopted is, that it is due to the projection inwards of the ischial spines, which narrow the transverse diameter of the pelvic outlet. As the pains force the occiput downwards, its rotation backwards is prevented by the projection of the left ischial spine, while its rotation forwards is favored by the smooth bevelled surface of the ascending ramus of the ischium. Similarly the ischial spine on the opposite side prevents the rotation forwards of the forehead, which is guided backwards to the cavity of the sacrum by the smooth surface of the sacro-ischiatic ligaments. These arrangements, therefore, give a screwlike form to the interior of the pelvis; and as the pains force the head downwards, they are effectual in imparting to it the rotatory movement which is of such importance in adapting it to the longest measurement of the outlet.

By most of the German obstetricians the influence of the ischial spines, and of the smooth pelvic planes, in producing rotation is not admitted. They rather refer the change of direction to the increased resistance the head meets from the posterior wall of the pelvis, and from the perineal structures. Whichever part of the head first meets this resistance, which is much greater than that of the anterior part of the pelvis, must necessarily be pressed forwards; and as, in the large majority of cases, the posterior fontanelle descends first, it is thus pressed forwards until rotation is effected. This view has the advantage of accounting equally well for the rotation in occipito-posterior as in occipito-anterior positions, the former of which, on the more ordinarily received theory, are not quite satisfactorily explicable. It does not follow that the smooth surfaces of the pelvic planes are without influence in favoring the rotation. On the contrary, they probably greatly facilitate it; but it is more simply and effectually explained by the latter theory than by that which attributes so important an action to the ischial spines.

In some rare cases the head escapes rotation and reaches the perineum still lying in the oblique diameter. Even here, however, rotation is generally effected, often suddenly, just as the head is about to pass the vulva, and it is very rarely expelled in the oblique position. The movement at this stage may be explained by the perineum, which is attached at its sides and grooved in its centre: to the hollow so formed the long diameter of the head accommodates itself, and is thus rotated into the antero-posterior diameter of the outlet.

5. *Extension.*—By the process just described the face is turned back into the hollow of the sacrum; but the head does not lie absolutely in the antero-posterior diameter of the pelvic outlet, but rather in one between it and the oblique. The occiput is still forced down by the pains, and, in consequence of its altered position, is enabled to pass between the rami of the pubis, and advances until its further descent is checked by the nape of the neck, which is pressed under and against the arch of the pubes. By this means the occiput is fixed, and the pains continuing, the uterine force no longer acts on the occiput, but on the anterior part of the head, which is now pushed down and separated from the sternum. This constitutes *extension.* As the head descends, the soft structures of the perineum are stretched, and the coccyx pushed back so as to enlarge the outlet. The pains continue to distend the perineum more and more, the head advancing and receding with each pain. As the forehead descends, the sub-occipito-bregmatic, the sub-occipito-frontal, and the sub-occipito-mental diameters successively present; the occiput turns more and more upwards in front of the pubes, and, at last, the face sweeps over the perineum and is born.

The mechanical cause of this movement may be readily explained. As soon as the occiput has passed under the arch of the pubis, and is no longer resisted by the anterior pelvic walls, the head is subjected to the action of two forces: that of the uterine pressure acting downwards and backwards; and that of the resistance of the posterior walls of the pelvis and the soft parts, acting almost directly forwards. The necessary result is that the head is pushed in a direction intermediate between these two opposing forces—that is, downwards and forwards in the axis of the pelvic outlet.

In addition to the slight obliquity which exists as regards the direct relation of the long diameter of the head to the antero-posterior diameter of the outlet at the moment of its expulsion, the head also lies somewhat obliquely in relation to its own transverse diameter, so that, in the majority of cases, the right parietal bone is expelled before the left.

6. *External Rotation.*—Shortly after the head is expelled, as soon as renewed uterine action commences, it may be observed to make a distinct rotatory movement, the occiput turning to the left thigh of the mother, and the face turning upward to the right thigh. The reason of this is evident. When the head descends in the right oblique diameter the shoulders lie in the opposite or left oblique diameter, and as the head rotates into the antero-posterior diameter, they are necessarily placed more nearly in the transverse. As soon as the head is expelled the shoulders are subjected to the same uterine force and pelvic resistance as the head has just been, and they are acted on in precisely the same way. Consequently they too rotate, but in the opposite direction, into the antero-posterior diameter of the outlet, or nearly so, just as the head did, and as they do so, they necessarily carry the head with them, and cause its external rotation.

The two shoulders are soon expelled, the left shoulder generally the first, sweeping over the perineum in the same manner as the face. This is, however, not always the case, and they are often expelled simultaneously, or the right shoulder may come first. The body soon follows, and the second stage of labor is completed.

Second Position.—In the second position (right occipito-cotyloid) the long diameter of the head lies in the left oblique diameter of the pelvis. On making a vaginal examination, in the ordinary obstetric position, the finger, passing upwards and to the right, feels the small posterior fontanelle; downwards and to the left, it feels the anterior. The sagittal suture lies obliquely across the pelvis in the left oblique diameter. The description of the mechanism of delivery is precisely the same as in the first position, substituting the word left for right. Thus the finger impinges on the left parietal bone, the occiput turns from right to left during rotation. After the birth of the head the occiput turns to the right thigh of the mother, the face to the left thigh.

Third, or Right Occipito-sacro-iliac Position.—In the third position the head enters the pelvic brim with the occiput directed backwards to the right sacro-iliac synchondrosis, and the sinciput forwards to the left foramen ovale. The posterior fontanelle is directed backwards, the anterior fontanelle forwards, while the examining finger impinges on the left parietal bone. The mechanism of delivery in these cases is of much interest. In the large majority of cases, during the progress of delivery, the occiput rotates forwards along the right side of the pelvis, until it comes to lie almost in the antero-posterior diameter of the outlet, and passes

* Die Vier Factoren der Geburt, Berlin, 1869.

under the pubic arch, the forehead passing over the perineum. It will be seen that during part of this extensive rotation the head must lie in the second position, and the case terminates just as if it had been in the second position from the commencement of labor.

Manner in which the Occiput is Rotated Forwards.—How is it that this rotation is effected, and that the sinciput, occupying the position of the occiput in the first position, should not be rotated forwards to the pubes as that is? This, no doubt, may be explained by the fact, that the uterine force transmitted through the vertebral column causes the occiput to descend lower than the sinciput, so that in most cases, in making a vaginal examination, the posterior fontanelle can be readily felt, while the anterior is high up and out of reach. The head is, therefore, extremely flexed, and so descends into the pelvic cavity, until the occiput, being now below the right ischial spine, experiences the resistance of the pelvic floor, opposite the right sacro-ischiatic ligament, by which it is directed forwards. The forehead is, at this time, supposing flexion to be marked, too high to be influenced by the anterior pelvic plane. Pressure continuing, the occiput rotates forwards, the forehead passes round the left side of the pelvis, and labor is terminated as in the second position.

The period of labor at which rotation takes place varies. In the majority of cases it does not occur until the head is on the floor of the pelvis, for it is then that resistance is most felt; but the greater the resistance, the sooner will rotation be produced. Hence it is more likely to occur early when the head is large and the pelvis comparatively small.

The facility with which this movement is effected obviously depends upon the complete flexion of the chin on the sternum, by which the anterior fontanelle is so elevated that its rotation backwards is not resisted by the inward projection of the left ischial spine, and the occiput is correspondingly depressed. If, however, this flexion is not complete, and the anterior fontanelle is so low as to be readily within reach of the finger, considerable difficulty is likely to be experienced. In many such cases rotation is still eventually effected, but in others it is not; and the labor is then terminated with the face to the pubes, but at the expense of considerable delay and difficulty. According to Dr. Uvedale West, of Alford, who devoted much careful study to the subject, this termination occurs in about 4 per cent. of occipito-posterior positions. When it is about to happen the anterior fontanelle may be felt very low down, and, sometimes, even the forehead and superciliary ridges. The uterine force pushes down the occiput, the sinciput being fixed behind the pubes, which it obviously cannot pass under, as does the occiput in the first position. The sinciput, therefore, becomes more flexed and pushed upwards, while the resistance of the pelvic floor directs the occiput forwards. The perineum now becomes enormously distended by the back part of the head, and is in great danger of laceration. The occiput is eventually, but not without much difficulty, expelled. A process of extension now occurs, the nape of the neck being fixed, as it were, against the centre of the perineum, the expelling force now acting on the forehead, and producing rotation of the head on its transverse axis. The forehead and face are thus protruded, and the body follows without difficulty.

It is said that, in a few exceptional cases, where the anterior fontanelle is much depressed, the labor may terminate by the conversion of the presentation into one of the face, the head rotating on its transverse axis, the forehead passing to the posterior part of the pelvis, and the chin emerging under the perineum. It is obvious, however, that this change can only occur when the head is unusually small, and it must of necessity be extremely rare.

Relative frequency of Second and Third Positions.—Reference has already been made to Naegele's views as to the rarity of the second position, and to his opinion that cases in which the occiput was found to point to the right foramen ovale were only transitional stages in the rotation of occipito-posterior positions. Such an assumption, however, is unwarrantable, unless the case has been watched from the very commencement of labor. Many perfectly qualified observers have arrived at the conclusion that second positions are far more common than Naegele supposed; and in the table already quoted it will be seen that while Murphy estimates the second and third as being equally frequent, Swayne believes the second to be much more common than the third. It is probable that the weight of Naegele's authority has induced many observers to classify second positions as third positions in which partial rotation has already been accomplished. My own experience would certainly lead me to think that second positions are very far from uncommon. The question, however, must be considered to be in abeyance, until further observations by competent authorities enable us to decide it conclusively.

Fourth or Left Occipito-sacro-ischiatic.—The fourth position is just as much the reverse of the second as the third is of the first. The occiput points to the left (Fig. 74) sacro-iliac synchondrosis, and

Fig. 74.

Fourth Position of Occiput at Pelvic Brim.

the finger impinges on the right parietal bone. The mechanism is precisely the same as in the third position, the rotation taking place from left to right.

Formation of the Caput Succedaneum.—The formation of the caput succedaneum has been already alluded to. This term is applied to the œdematous swelling which forms on the head, and is produced by effusion from the obstruction of the venous circulation caused by the pressure to which the head is subjected. It follows that the size of the swelling is in direct proportion to the length of the labor. In rapid deliveries, in which the head is forced through the pelvis quickly, it is scarcely, if at all developed; while after protracted labors it is large and distinct, and may obscure the diagnosis of the position, by preventing the sutures and fontanelles being felt. Its situation varies according to the position of the head: thus, in the first and fourth positions it forms on the right parietal bone; in the second and third on the left; and we may, therefore, verify, by inspection of its site, the accuracy of our diagnosis.

An ordinary mistake which has been made by obstetricians is to regard the caput succedaneum as formed at the point where the head has been most subjected to pressure; while, in fact, it forms on that part which is most unsupported by the maternal structures, and where the swelling may consequently most readily occur. Therefore, in the early stages of the labor, it always forms on the part of the head which lies in the circle of the os uteri; while, in subsequent stages, it forms on that which lies in the axis of the vaginal canal, and eventually is most prominent on the part that is first expelled from the vulva.

Alteration in the Shape of the Head from Moulding.—A few words may be said as to the alteration in the form of the fœtal head which occurs in tedious labors, and results from the moulding which it has undergone in its passage through the pelvis. The smaller the pelvis, and the greater the pressure applied to the head during delivery, the more marked this is. The result is, that in vertex presentations the occipito-mental and occipito-frontal diameters are elongated to the extent of an inch, or even more, while the transverse diameters are lessened, from compression of the parietal bones. This moulding is of unquestionable value in facilitating the

birth of the child. The amount of apparent deformity is very considerable, and may even give rise to some anxiety. It is well to remember, therefore, that it is always transient, and that in a few hours, or days at most, the elasticity of the soft cranial bones causes them to resume their natural form. The caput succedaneum also disappears rapidly, therefore no amount of deformity from either of these causes need give rise to anxiety, or call for any treatment.

SECTION III.

MANAGEMENT OF NATURAL LABOR.

Although labor is a strictly physiological function, and in a large majority of cases might, no doubt, be safely accomplished without assistance from the accoucheur, still medical aid, properly given, is always of value in facilitating the process, and is often absolutely essential for the safety of the mother and child.

Preparatory Treatment.—The management of the pregnant woman before delivery is a point which should always receive the attention of the medical attendant, since it is of consequence that the labor should come on when she is in as good a state of health as possible. For this purpose ordinary hygienic precautions should never be neglected in the latter months of gestation. The patient should take regular and gentle exercise, short of fatigue, and, if the weather permit, should spend as much of her time as possible in the open air. Hot rooms, late hours, and excitement of all kinds should be strictly avoided. The diet should be simple, nutritious, and unstimulating. The state of the bowels should be particularly attended to. During the few days preceding labor the descent of the uterus often causes pressure on the rectum and prevents its evacuation. Hence it is customary to prescribe occasional gentle aperients, such as small doses of castor oil, for a few days before the expected period of delivery. Some caution, however, is necessary, as it is certainly not very uncommon for labor to be determined rather sooner than was anticipated, in consequence of the irritation of too large a purgative dose. The state of the bowels should always be inquired into at the commencement of labor, and, if there be any reason to suspect that they are loaded, a copious enema should be administered. This is always a proper precaution to take, for a loaded rectum is a common cause of irregular and ineffective uterine action; and even when it does not produce this result, the escape of the feces, in consequence of pressure on the bowel during the propulsive stage, is always disagreeable both to the patient and practitioner.

Dress of Patient During Pregnancy.—The dress of the patient during pregnancy may be here adverted to; for much discomfort may arise, and the satisfactory progress of labor may even be interfered with, from errors in this respect.

After the uterus has risen out of the pelvis the ordinary corset, which most women wear, is apt to produce very injurious pressure; still more so when attempts are made to conceal the increased size by tight lacing. After the fourth or fifth month, therefore, the comfort of the patient is much increased by wearing a specially constructed pair of stays, with elastic let into the sides and front, so that they accommodate themselves to the gradual increase of the figure. Such are made by all stay-makers, and should be worn whenever the circumstances of the patient permit. Failing this, it is better to avoid the use of the corset altogether, and to have as little pressure on the uterus as possible; although many women cannot do without the support to which they are accustomed. To multiparæ, especially if there be much laxity of the abdominal parietes, a well-fitting elastic abdominal belt is often a great comfort. This is constructed so that it can be tightened when the patient is walking and in the erect position, when such support is most required, and readily loosened when desired.

Necessity of Attending to the First Summons.—It is hardly necessary to insist on the necessity of the practitioner attending immediately to the first summons to the patient. It is true that he may very often be sent for long before he is actually required. But on the other hand, it is quite impossible to foresee what may be the state of any individual case. By prompt attention he may be able to rectify a malposition, or prevent some impending catastrophe, and thus save his patient from consequences of the utmost gravity.

Articles to be taken by the Accoucheur.—The practitioner should always be provided with the articles which he may require. The ordinary obstetric cases, containing one or two bottles and a catheter, such as are sold by most instrument-makers, are cumbrous and useless: while "obstetric bags" are expensive luxuries not within the reach of all. Every one can manufacture an excellent obstetric bag for himself, at a small expense, by having compartments for holding bottles stitched on to the sides of an ordinary leather bag, such as is sold for a few shillings at any portmanteau-maker's. It is a great comfort to have at hand all that may be required, and the bag should contain chloroform or other anæsthetic, chloral, laudanum, the liquor ferri perchloridi of the Pharmacopœia, the liquid extract of ergot, and a hypodermic syringe, with a bottle containing a solution of ergotine for subcutaneous injection. If it also contain a Higginson's syringe, a small elastic catheter, a good pair of forceps, and one or two suture needles, with some silver wire or carbolized catgut, the practitioner is provided against any ordinary contingency. Other articles that may be required, such as thread, scissors, and the like, are generally provided by the nurse or patient.

Duties on first Visiting the Patient.—On arriving at the house the practitioner should have his visit announced to the patient, and he will very often find that the first effect of his presence is to arrest the pains that have been hitherto progressing rapidly; thereby affording a very conclusive proof of the influence of mental impressions on the progress of labor. If the pains be not already propulsive, it is well that he should occupy himself at first in general inquiries from the attendants as to the progress of the labor, and in seeing that all the necessary arrangements are satisfactorily carried out, so as to allow the patient time to get accustomed to his presence. If he have any choice in the matter, he should endeavor to secure a large, airy, and well-ventilated apartment for the lying-in room, as far removed as possible from without. He may also see to the bed, which should be without curtains, and prepared for the labor by having a water-proof sheeting laid under a folded blanket or sheet, on which the patient lies. These receive the discharges during labor, and can be pulled from under the patient after delivery, so as to leave the dry clothes beneath. Among the lower classes, the lying-in chamber is considered a legitimate meeting-place for numerous female friends to gossip, whose conversation is often distressing, and is certainly injurious, to a woman in the excitable condition associated with labor. The medical attendant should, therefore, insist on as much quiet as possible, and should allow no one in the room except the nurse and some one friend whose presence the patient may desire. The husband's presence must be left to the wishes of the patient. Some women like their husbands to be with them, while others prefer to be without them, and the medical attendant is bound to act in accordance with the patient's desire.

Vaginal Examination.—If pains be actually present, a vaginal examination is essential, and should not be delayed. It enables us to ascertain whether the labor has commenced or not, and whether the presentation is natural or otherwise. The pains, although apparently severe, may be altogether spurious, and labor may not have actually commenced. It is of much importance, both for our own credit and comfort, that we should be able to diagnose the true character of the pains; for if they be so-called "false" pains, we might wait hours in fruitless expectation of progress, while delivery is still far off. The necessity of ascertaining, therefore, the actual state of affairs need not further be insisted on.

Character of False Pains.—*False* pains are chiefly characterized by their irregularity, sometimes coming on at short intervals, sometimes with many hours between them; they also vary much in intensity, some being very sharp and painful, while others are slight and transient. In these respects they differ from the *true* pains of

the first stage, which are at first slight and short, and gradually recur with increased force and regularity. The situation of the two kinds of pains also varies, the false pains being chiefly situated in front, while the true pains are felt most in the back, and gradually shoot round toward the abdomen. Nothing short of a vaginal examination will enable us to clear up the diagnosis satisfactorily. If the labor have actually commenced, the os will be more or less dilated, and its edges thinned; while with each pain the cervix will become rigid, and the membranes tense and prominent. The false pains, on the contrary, have no effect on the cervix, which remains flaccid and undilated; or, if the os be sufficiently open to admit the tip of the finger, the membranes will not become prominent during the contraction. Under such circumstances we may confidently assure the patient that the pains are false, and measures should be taken to remove the irritation which produces them. In the large majority of cases the cause of the spurious pains will be found to be some disordered state of the intestinal tract; and they will be best remedied by a gentle aperient—such as castor oil, or the compound colocynth pill with hyoscyamus—followed by, or combined with, a sedative, such as twenty minims of laudanum or chlorodyne. Shortly after this has been administered the false pains will die away, and not recur until true labor commences.

Mode of Conducting a Vaginal Examination.—For a vaginal examination the patient is placed by the nurse on her left side, close to the edge of the bed, with the legs flexed on the abdomen. The practitioner being seated by the edge of the bed, passes the index finger of the right hand, previously lubricated with lard or cold cream, up to the vulva, and gently insinuates it into the orifice of the vagina, then pushes it backwards in the axis of the vaginal outlet, and finally turns it upwards and forwards so as to more readily reach the cervix. This it may not always be easy to do, for at the commencement of labor the cervix may be so high as to be reached with difficulty, or it may be directed backwards so as to point towards the cavity of the sacrum. The exploration is often much facilitated by depressing the uterus from without, by the left hand placed on the abdomen. Our object is not only to ascertain the state of the cervix as to softness and dilatation, but also the presentation, the condition of the vagina, and the capacity of the pelvis. The examination is generally commenced during a pain, at which time it is less distressing to the patient; but in order to be satisfactory, the finger must remain in the vagina until the pain is over, the examination being concluded in the interval between this pain and the next.

In head presentations the round mass of the cranium is generally at once felt through the lower part of the uterus, and then we have the satisfaction of being able to assure the patient that all is right. If the os be sufficiently dilated, we can also feel through it the occiput covered by the membranes. It is impossible at this time to make out the exact position of the head by means of the sutures and fontanelles, which are too high up to be within reach. Nor should any attempt be made to do so, for fear of prematurely rupturing the membranes. The fact that the head is presenting is all that we require to know at this stage of the labor.

The Condition of the Os as indicating the Progress of Labor.—The condition of the os itself, as to rigidity and dilatation, will materially assist us in forming an opinion as to the progress and probable duration of the labor; but, although the friends will certainly press for an opinion on this point, the cautious practitioner will be careful not to commit himself to a positive statement, which may so easily be falsified. It will suffice to assure the friends that everything is satisfactory, but that it is impossible to say with any certainty how rapidly, or the reverse, the case may progress.

If the pains be not very frequent or strong, and the os not dilated to more than the size of a shilling, a considerable delay may be anticipated, and the presence of the medical attendant is useless. He may, therefore, safely leave the patient for an hour or more, provided he be within easy reach. It is needless to say that this should never be done unless the exact presentation be made out. If some part, other than the head, be presenting, it will probably be impossible to make it out until dilatation has progressed further; and the practitioner must be incessantly on the watch until the nature of the case be made out, so as to be able to seize the most favorable moment for interference, should that be necessary.

Position of Patient during First Stage.—The position of the patient is a matter of some moment in the first stage. It is a decided advantage that she should not be then in a recumbent position on her side, as is usual in the second stage; for it is of importance that the expulsive force should act in such a way as to favor the descent of the head into the pelvis, *i. e.*, perpendicularly to the plane of its brim, and also that the weight of the child should operate in the same way. Therefore, the ordinary custom of allowing the patient to walk about, or to recline in a chair, is

Fig. 75.

Examination during the first stage.

decidedly advantageous; and it will often be observed that the pains are more lingering and ineffective if she lie in bed. If the patient be a multipara, or if the abdomen be somewhat pendulous, an abdominal bandage, by supporting the uterus, will greatly favor the progress of this stage. Keeping the patient out of bed has the further advantage of preventing her being unduly anxious for the termination of the labor; and a little cheerful conversation will keep up her spirits, and obviate the mental depression which is so common. Good beef-tea may be freely administered, with a little brandy and water occasionally, if the patient be weak, and will be useful in supporting her strength.

Vaginal Examinations.—Over-frequent vaginal examinations at this period should be avoided, for they serve no useful purpose, and are apt to irritate the cervix. It will be necessary, however, to ascertain the progress of the dilatation at intervals.

Artificial Rupture of the Membranes.—When once the os is fully dilated the membranes may be artificially ruptured if they have not broken spontaneously, for they no longer serve any useful purpose, and only retard the advent of the propulsive stage. This can be easily done by pressing on them, when they are rendered tense during a pain, by some pointed instrument, such as the end of a hairpin, which is always at hand. In some cases, indeed, it is even expedient to rupture the membranes before the os is fully dilated. Thus it not infrequently happens, when the amount of liquor amnii is at all excessive, that the os dilates to the size of a five-shilling-piece or more; but, although it is perfectly soft and flaccid, it opens up no further until the liquor amnii is evacuated, when the propulsive pains rapidly complete its dilatation. Some experience and judgment are required in the detection of such cases, for if we evacuated the liquor amnii prematurely the pressure of the head on the cervix might produce irritation, and seriously prolong the labor. This manœuvre is most likely to be useful when the pains are strong

and the os perfectly flaccid, but when the membranes do not protrude through the os and effect further dilatation.

It is sometimes not easy to ascertain whether the membranes are ruptured or not. This is most likely to be the case when the head is low down, and the amount of liquor amnii is so small that the pouch does not become prominent during the pains. A little care, however, will enable us, if the membranes be ruptured, to feel the rugosities of the scalp covered with hair, and to distinguish it from the smooth polished surface of the membranes.

Treatment of the Propulsive Stage.—After the evacuation of the liquor amnii there is generally a lull in the progress of the labor, the pains, however, soon recurring with increased force and frequency, and propelling the head through the pelvic cavity. The change in the character of the pains is soon appreciated by the bearing down efforts by which they are accompanied, as well as by their increased length and intensity.

Position of the Patient during the Second Stage.—It is now advisable that the patient be placed in bed; and in this country it is usual for her to lie on her left side, with her nates parallel to the edge of the bed, and her body lying across it. This is the established obstetric position in England, and it would be useless to attempt to insist on any other, even if it were advisable. Although the dorsal position is preferred on the Continent, it is difficult to see wherein its advantages consist. It certainly leads to unnecessary exposure of the person, and it is, on the whole, less easy to reach the patient, so placed, for the necessary manipulations. Moreover, the dorsal position increases the risk of laceration of the perineum, by bringing the weight of the child's head to bear more directly upon it. Thus Schroeder found that lacerations occurred in 37.6 per cent. of cases delivered on the back, as against 24.4 per cent. in other positions.

The patient usually remains in bed during the whole of this stage, and it is customary for the nurse to tie to the foot of the bed a jack-towel, which is laid hold of and used as a support in making bearing down efforts. If the pains be few and far between, and the patient finds it more comfortable to get up occasionally, there is no reason why she should not do so. On the contrary, as we shall subsequently see in treating of lingering labor, the pains under such circumstances are often increased in the sitting posture, in consequence of the weight of the child producing increased pressure on the nerves of the vagina.

Detection of the Position of the Head.—At this time vaginal examination, which should be more frequently repeated than in the first stage, enables us to ascertain precisely the position of the head, by means of the sutures and fontanelles, as well as to watch its progress.

Management of the Anterior Lip of Cervix when impacted between the Head and Pelvis.—It not infrequently happens that the head descends into the pelvis, even to its floor, without the os having entirely disappeared. The anterior lip especially is apt to get caught between the head and pubis, to become swollen by the pressure to which it is subjected, and then to retard the progress of the labor. There can be no reasonable objection to attempting to prevent this cause of delay by pressing on the incarcerated lip during the interval of the pains, so as to push it above the head, and maintain it there during the pains until the head descends below it. This manœuvre, if done judiciously, and without any undue roughness or force, is certainly not liable to be attended by any of the evil consequences which many obstetricians have attributed to it; it is indeed a matter of common sense that the injury to the cervix is likely to be less if it be pushed gently out of the way, than if it be left to be tightly jammed for hours between the presenting part and the bony pelvis. This mode of assistance is very different from the digital dilatation of a rigid cervix, which was formerly much practised, especially in Edinburgh, in consequence of the recommendation of Hamilton, and which was properly objected to by the great majority of obstetricians.

If the pains be producing satisfactory progress, no further interference is required. The medical attendant should, however, see that the bladder is evacuated; and if it have not been so for some hours, it may be necessary to draw off the urine by the catheter. Whenever the labor is lengthy, he should occasionally practise auscultation, so as to satisfy himself that the fœtal circulation is being satisfactorily carried on.

Regulation of the Voluntary Bearing-down Efforts.—The regulation of the bearing-down efforts at this time is of importance. It is common for the nurse to urge the patient to help herself by straining, and it is certain that by voluntary exertion of this kind she can materially increase the action of the accessory muscles of parturition. If the pains be strong, and the labor promise to be rapid, such voluntary exertions are not likely to be prejudicial. On the other hand, if the case be progressing slowly, they only unnecessarily fatigue the patient, and should be discouraged. When the perineum is distended we may even find it advisable to urge the patient to cease all voluntary effort, and to cry out, for the express purpose of lessening the tension to which the perineum is subjected. This is the stage in which anæsthesia is most serviceable, but its employment must be separately discussed.

Distension of the Perineum.—As the head descends more and more the perineum becomes distended, and there is considerable difference of opinion amongst accoucheurs as to the management of the case at this time. In most obstetric works the practitioner is advised to endeavor to prevent laceration by the manœuvre that is described as "supporting the perineum." By this is meant, laying the palm of the hand on the distended structures, and pressing firmly upon them during the acme of the pain, with the view of mechanically preventing their tearing. There can be little doubt that this, or some modification of it, is the practice now followed by the large majority of practitioners. Of late years the evil effects likely to follow it have been specially dwelt upon by Graily Hewitt, Leishman, Goodell, and other writers, who maintain that by pressure exerted in this fashion we not only fail to prevent, but actually favor laceration, in consequence of the pressure producing increased uterine action, just at the time when forcible distension of the perineum is likely to be hurtful. Therefore some hold that the perineum ought to be left entirely alone, and that the head should be allowed gradually to distend it, without any assistance on the part of the practitioner.

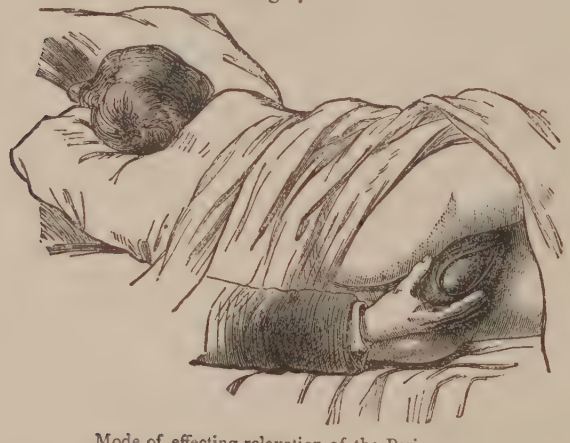
Much error may be traced to a misconception of what is required. The term "supporting the perineum" conveys an unquestionably erroneous idea, and it is certain that no one can prevent laceration by mechanical support. If the term "relaxation of the perineum" were employed, we should have a far more accurate idea of what should be aimed at, and if this be borne in mind, I think it cannot be questioned that nature may be most usefully assisted at this stage.

Dr. Goodell's Method.—Dr. Goodell, of Philadelphia, has specially studied this subject, and has recommended a method, the object of which is to relax the perineum. His advice is, that one or two fingers of the left hand should be inserted into the rectum, by which the perineum should be hooked up and pulled forward over the head, towards the pubis, the thumb of the same hand being placed on the advancing head, so as to restrain its progress if needful. I have adopted this plan frequently, and believe that it admirably answers its purpose, especially when the perineum is greatly distended and laceration is threatened. It must be admitted that the insertion of the fingers into the anal orifice, in the manner recommended, is repugnant both to the practitioner and patient, and the same result can be obtained in a less unpleasant way. I mention it, however, to show what it is that the practitioner must aim at. If, when the head is distending the perineum greatly, the thumb and forefinger of the right hand are placed along its sides, it can be pushed gently forward over the head at the height of the pain, while the tips of the fingers may, at the same time, press upon the advancing vertex, so as to retard its progress if advisable (Fig. 76). By this means the sudden and forcible stretching of the perineal structures is prevented, and the chance of laceration reduced to a minimum, while nature's mode of relaxing the

tissues, by dilatation of the anal orifice, is favored. This is very different from the mechanical support that is usually recommended, and the less pressure that is applied directly to the perineum the better. Nor is it either needful or advisable to sit by the patient with the hand applied to the perineum for hours, as is so often practised. Time should be given for the gradual distension of the tissues by the alternate advance and recession of the head, and we need only intervene to assist relaxation when the stretching has reached its height and the head is about to be expelled. A napkin may be interposed between the hand and the skin, for the purpose of cleanliness. Should the perineum be excessively tough and resistant, assiduous fomentation with a hot sponge may be resorted to, and will be of some service in promoting relaxation.

Incision of the Perineum.—When the tension is so great that laceration seems inevitable, it is generally recommended that a slight incision should be made on each side of the central raphé, with the view of preventing spontaneous laceration. This may no doubt be done with perfect safety, but I question if it is likely to be of use. The idea is that an incised wound is likely to heal more readily than a lacerated one. When, however, a distended perineum ruptures, its structures are so thinned that the tear is always linear; and, as a matter of fact, the edges of the tear are always as clean, and as closely in apposition, as if the cut had been made with a knife. Moreover, the laceration invariably heals perfectly, if only the edges be brought into contact at once with one

Fig. 76.



Mode of effecting relaxation of the Perineum.

or two metallic sutures. I believe, therefore, that Goodell is right in stating that incision of the perineum is rarely, if ever, necessary, unless it is hardened by previous cicatrization. In almost all first labors, the fourchette is torn, but requires no treatment of any kind. In some cases, do what we will, more or less laceration occurs, and the perineum should always be examined after the expulsion of the child, to see if any tear has taken place.

Treatment of Lacerations.—If it has given way to any extent, I believe that it is good practice to insert one or two interrupted sutures of silver wire or carbolized gut at once. Immediately after delivery the sensibility of the tissues is deadened by the distension to which they have been subjected, and the sutures can be inserted with little or no pain. It is quite true that lacerations of an inch or less will generally heal perfectly well of themselves; but this is not invariably the case, while healing almost certainly follows if the edges be brought together at once. In the severer forms of laceration, extending back to, or even through the sphincter, the precaution is all the more necessary, and a subsequent operation of gravity may in this way be avoided. The sutures can be removed without difficulty in a week or so, when complete adhesion has taken place.

[The obstetrician should never neglect to examine the perineum after delivery, and in many cases a tear, more or less extensive, will be found though not before suspected, and while a small rent may fill up by granulation, we have always been in the habit of introducing one or two silver wire sutures, rather than trust the case to nature alone.—G.]

Expulsion of the Child.—The head when expelled should be received in the palm of the right hand, while the left hand is placed upon the abdomen to follow down the uterus as it contracts and expels the body. There is generally some little delay after the expulsion of the head, and we should now see if the cord surround the neck, and if it does so, it should be drawn over the head. The expulsion of the body should be left entirely to the uterine contractions. If there be undue delay we may endeavor to excite uterine action by friction on the fundus, and it will rarely happen that sufficient contraction does not now come on. If we display undue haste in withdrawing the body, we run the risk of emptying the uterus while its tissues are relaxed, and so favor hemorrhage. If, however, there seem serious danger of the child being asphyxiated, its expulsion may be favored by gently passing the forefinger of each hand within the axillæ, and using traction; but it is only very exceptionally that such interference is required.

Promotion of Uterine Contraction after the Birth of the Child.—As the uterus contracts, it should be carefully followed down through the abdominal parietes by the left hand, which should grasp it as the body is expelled, with the view of seeing that it is efficiently contracted. This is a point of vital importance in preventing hemorrhage, which will presently be more especially considered.

[This subject has been so extensively discussed that we will only occupy space enough to say, that we have always delayed from ten to fifteen minutes before tying the cord, and shall continue to do so.—G.]

Ligature of the Cord.—As soon as the child cries we may proceed to tie and separate the cord. For this purpose the nurse usually provides ligatures composed of several strands of whitey-brown thread; but tape, or any other suitable material, may be employed. It is important, especially if the cord be very thick and gelatinous, to see that it is thoroughly compressed, so that the vessels are obliterated, otherwise secondary hemorrhage might occur. The cord is tied about an inch and a half from the child, and it is usual, though of course not essential, to place a second ligature about two inches nearer the placental extremity of the cord. The latter is, perhaps, of some use by retaining the blood, and thus increasing the size of the placenta and favoring its more ready expulsion by uterine contraction. The cord is then divided with scissors between the ligatures, the child wrapped up in flannel and given to the nurse, or a bystander, to hold, while the attention of the practitioner is concentrated on the mother, with a view to the proper management of the third stage of labor.

Importance of Proper Management of Third Stage.—There is unquestionably no period of labor where skilled management is more important, and none in which mistakes are more frequently made. By proper care at this time the risk of post-partum hemorrhage is reduced to a minimum, the efficient contraction of the uterus is secured, the amount and intensity of after-pains are lessened, and the safety and comfort of the patient greatly promoted. Moreover, the general practice as to the management of this stage is opposed to the natural mechanism of placental expulsion, and is far from being well adapted to secure the important objects which we ought to have in view. Let us see what is the practice usually recommended and followed, and then we shall be in a position to understand in what respects it is erroneous. For this purpose I cannot do better than copy the directions contained in one of our most deservedly popular obstetric text-books, which undoubtedly expresses the usual practice in the management of this stage. "When the binder is applied the patient may be allowed to rest a while, if there is no flooding; after which, *when the uterus contracts*, gentle traction may be made by the funis, to ascertain if the placenta be detached. If so, and especially if it be in the vagina, it may be removed by continuing the traction steadily in the axis of the upper outlet at first, at the same time making pressure on the uterus."*

*Churchill's Theory and Practice of Midwifery, p. 162.

Objections to Ordinary Practice.—This may fairly be taken as a sufficiently accurate description of the practice usually followed. The objections I have to make are: (1) That it inculcates the common error of relying on the binder as a means of promoting uterine contraction, advising its application before the expulsion of the placenta; while I hold that the binder should never be applied until after the placenta is expelled, and not even then unless the uterus is perfectly and permanently contracted. (2) That it teaches that traction on the cord should be used as a means of withdrawing the placenta; whereas the uterus itself should be made to expel the after-birth, and, in nineteen cases out of twenty, the finger need never be introduced into the vagina after the birth of the child, nor the cord touched. This may seem an exaggerated statement to those who have accustomed themselves to the usual method of dealing with the placenta; but I feel confident that all who have learnt the method of expression of the placenta would testify to its accuracy.

Expression of the Placenta.—The cardinal point to bear in mind is, that the placenta should be expelled from the uterus by a *vis a tergo*, not drawn out by a *vis a fronte*. That uterine pressure after the birth of the child has been recommended by many English writers is certain, and the Dublin school especially have dwelt on its importance as a preventive of post-partum hemorrhage; but the distinct enunciation of the doctrine that the placenta should be pressed, and not drawn, out of the uterus, we owe to Credè and other German writers; and it is only of late years that this practice has become at all common. Those who have not seen placental expression practised find it difficult to understand that, in the large majority of cases, the uterus may be made to expel the placenta out of the vagina; but such is unquestionably the fact. A little practice is no doubt necessary to effect this satisfactorily; but when once the knack has been learnt, there is little difficulty likely to be experienced.

Importance of not Removing the Placenta Hurriedly.—Before describing the method of placental expression, a word of caution may be said against undue haste in attempting expression of the placenta, a mistake that is often made, and which, I believe, tends to increase the risk of post-partum hemorrhage. So long as we satisfy ourselves that the uterus is fairly contracted, so as to avoid the possibility of its distension with blood, a certain delay after the birth of the child is useful, from its giving time for coagula to form within the uterine sinuses, by which their open mouths are closed up. The importance of this point has been specially dwelt upon by McClintock, who lays down the rule that 15 or 20 minutes should be allowed to elapse, after the birth of the child, before any attempt to remove the after-birth is made. This is a good and safe practical rule, as it gives ample time for the complete detachment of the placenta, and the coagulation of the blood in the uterine sinuses.

Mode of Effecting Expression of the Placenta.—During this interval the practitioner or nurse should sit by the bedside, with the hand on the uterus to secure contraction and prevent distension; but not kneading or forcibly compressing it. When we judge that a sufficient time has elapsed, we may proceed to effect expulsion. For this purpose the fundus should be grasped in the hollow of the left hand, the ulnar edge of the hand being well pressed down behind the fundus, and *when the uterus is felt to harden*, strong and firm pressure should be made downwards and backwards in the axis of the pelvic brim. If this manœuvre be properly carried out, and sufficiently firm pressure made, in almost every case the uterus may be made to expel the placenta into the bed, along with any coagula that may be in its cavity. The uterine surface of the placenta is generally expelled first, the cord being within the membranes; whereas the fœtal surface, and root of the cord, are the parts which appear first when the placenta is removed by traction. If we do not succeed at the first effort, which is rarely the case if extrusion be not attempted too soon after the birth of the child, we may wait until another contraction takes place, and then reapply the pressure. I repeat that, after a little practice, the placenta may be entirely expelled in this way, in nineteen cases out of twenty, without even touching the cord, and the bugbear of retained placenta will cease to be a source of dread.

Management of the Membranes.—Should we fail in causing the uterus to expel the placenta, a vaginal examination may be made, and, if the placenta be found lying entirely in the vagina, it may be carefully withdrawn. If, however, the cord can be traced up through the os, showing that the placenta is still within the uterine cavity, we must again resort to pressure to effect its expulsion, and not attempt to withdraw it by traction. Such cases may fairly be classed as retained placenta, but they should be very rarely met with, and are discussed elsewhere. When they do occur often in the hands of the same practitioner, it is fair to conclude that he has not properly acquired the art of managing this stage of labor. Generally speaking, the placenta should be expelled within twenty minutes after the birth of the child; but no doubt, in the large majority of cases, expulsion might be effected sooner were it advisable to attempt it.

When the mass of the placenta is expelled, the membranes generally still remain in the vagina, and they should be twisted into a rope, and very gently withdrawn, so as not to leave any portion behind. This is a precaution the importance of which I would strongly urge, for I believe that the chance of part of the membranes being torn off and left in utero is the one objection to the method recommended. With due care, however, this accident may be avoided, and the risk will be lessened if the placenta is received into the palm of the right hand, on expression, so as to avoid any strain on the membranes.

Compression of the Uterus after the Expulsion of the Placenta.—The duties of the medical attendant are not even now over. For at least ten minutes after the extrusion of the placenta, he should keep his hand on the firmly contracted uterus, gently kneading it, without any force, for the purpose of promoting firm and equable contraction, and causing it to throw off any coagula that may form in its cavity.

Administration of Ergot of Rye.—The subsequent comfort and safety of the patient may be promoted by administering at this time a full dose of ergot of rye, such as a drachm, or more, of the liquid extract. The property possessed by this drug of producing tonic and persistent contraction of the uterine fibres, which renders it of doubtful utility as an oxytocic during labor, is of special value after delivery, when such contraction is precisely what we desire. I have long been in the habit of administering the drug at this period, and believe it to be of great value, not only as a prophylactic against hemorrhage, but as a means of lessening after-pains.

Application of the Binder.—When we are satisfied that the uterus is permanently contracted we may apply the binder, but this should rarely be done until at least half an hour after the birth of the child. The soiled clothes should be gently withdrawn from under the patient, moving her as little as possible, and the binder should be, at the same time, slipped under the body, taking care that it is passed well below the hips, so as to secure a firm hold. No kind of bandage is better than a piece of stout jean, of sufficient breadth to extend from the trochanters to the ensiform cartilage; a jack-towel or bolster-slip answers the purpose very well. These are preferable, at any rate at first, to the shaped binders that are often used. One or two folded napkins are generally placed over the uterus, so as to form a pad to keep up pressure. Once in position, the binder is pulled tight and fastened by pins. The utility of careful bandaging after delivery can scarcely be doubted, although some years ago it became the fashion to dispense with it. It gives a comfortable support to the lax abdominal walls, keeps up a certain amount of pressure on the uterus, and tends to restore the figure of the patient. After the bandage is applied, a warm napkin should be placed on the vulva, as a means of estimating the quantity of the discharge, and the patient may be allowed to rest.

[Very many obstetricians of the present day are discarding

the binder, attributing to it very injurious effects; we have continued the use of it and have never seen any harm from its use, while the support is very grateful to the woman.—G.]

After-treatment.—Unless the labor have been very long and fatiguing, an opiate, often exhibited as a matter of routine, is unadvisable; although it may be well to leave one with the nurse, to be given if the patient cannot sleep, or if the after-pains be very troublesome. The practitioner may now leave the room, but not the house, and at least an hour should elapse after delivery before he takes his departure. Before doing so he should visit the patient, inspect the napkin to see that there is not too much discharge, and satisfy himself that the uterus is contracted, and not distended with coagula. He should also count the pulse, which, if the patient be progressing satisfactorily, will be found at its normal average. If, however, it be beating over 100 per minute, he should on no account leave, for such a rapidity of the circulation renders it extremely probable that hemorrhage is impending. This is a good practical rule, laid down by M'Clintock in his excellent paper "On the Pulse in Child-bed," attention to which may often save the patient from disastrous consequences.

Before leaving, the practitioner should see that the room is darkened, all bystanders excluded, and the patient left as quiet as possible to recover from the shock of labor.

SECTION IV.

ANÆSTHESIA IN LABOR.

A few words may be said as to the use of anæsthetics during labor, a practice which has become so universal that no argument is required to establish its being a perfectly legitimate means of assuaging the sufferings of childbirth. Indeed, the tendency in the present day is in the opposite direction; and a common error is the administration of chloroform to an extent which materially interferes with the uterine contractions, and predisposes to subsequent post-partum hemorrhage.

Agents Employed.—Practically speaking, the only agent hitherto employed in this country is chloroform, although the bi-chloride of methylene, and ether, have been occasionally tried. Of late years, chloral has been extensively used by some; and as I believe it to be an agent of very great value, I shall first indicate the circumstances under which it may be employed.

Chloral.—The peculiar value of chloral in labor is, that it may be safely administered at a time when chloroform cannot be generally employed. The latter, while it annuls suffering, very frequently tends, in a marked degree, to diminish uterine action. This is a familiar observation to all who have employed it much during labor, as the diminution of the force and intensity of the pains, and the consequent retardation of the labor, often oblige us to suspend its inhalation, at least temporarily. Indeed, this very property of annulling uterine action is one of its most valuable qualities in obstetrics, as in certain cases of turning. For such purposes it is necessary to give it to the surgical extent, which we endeavor to avoid when it is used simply to lessen the suffering of ordinary labor. Still it is not always easy to limit its action in this way, and thus it very frequently does more than we wish. Such diminution in the intensity of uterine contraction is comparatively of less consequence in the propulsive stage, and it is generally more than counterbalanced by the relief it affords. In the first stage it is otherwise, and, practically speaking, chloroform is generally not admissible until the head is in the pelvic cavity.

Chloral, on the other hand, has no such relaxing effects on uterine contraction. It cannot, it is true, compete with chloroform in its power of relieving pain, but it produces a drowsy state in which the pain is not felt nearly so acutely as before. It is, therefore, in the first stage of labor, while the pains are cutting and grinding, and during the dilatation of the cervix, that it finds its most useful application. It is especially valuable in those cases, so frequently met with in the upper classes, in which the pains produce intolerably acute suffering, with but little effect on the progress of the labor. In them the os is often thin and rigid, and the pains very frequent and acute, but little or no dilatation is effected. When the patient is brought under the influence of chloral, however, the pains become less frequent but stronger, nervous excitement is calmed, and the dilatation of the cervix often proceeds rapidly and satisfactorily. Indeed I know of nothing which answers so well in cases of rigid, undilatable cervix, and I believe its administration to be far more effective, under such circumstances, than any of the remedies usually employed.

Object and Mode of Administration.—The object is to produce a somnolent condition, which shall be protracted as long as possible. For this purpose 15 grains of chloral may be administered every twenty minutes, until three doses are given. This generally suffices to produce the desired effect. The patient becomes very drowsy, dozes between the pains, and wakes up as each contraction commences. It may be necessary to give a fourth dose, at a longer interval, say an hour after the third dose, to keep up and prolong the soporific action, but this is seldom necessary, and I have rarely given more than a drachm of chloral during the entire progress of labor. Another advantage of this treatment is that, while it does not interfere with the use of chloroform in the second stage, it renders it necessary to give less than otherwise would be called for, and thus its action can be more easily kept within bounds. On the whole, therefore, I am inclined to consider chloral a very valuable aid in the management of labor, and believe that it is destined to be much more extensively used than is at present the case. So far as my experience has yet gone I have not met with any symptoms which have led me to think that it has produced bad effects; and I have known many patients sleep quietly through labor, without expressing any excessive suffering, or asking for chloroform, who, under ordinary circumstances, would have been most urgently calling for relief. It occasionally happens that the patient cannot retain the chloral from its tendency to produce sickness; it may then be readily given per rectum in the form of enema.

Chloroform.—Generally speaking, we do not think of giving chloroform until the os is fully dilated, the head descending, and the pains becoming propulsive. It has often, indeed, been administered earlier, for the purpose of aiding the dilatation of a rigid cervix, and there is no doubt that it often succeeds well when employed in this way; but I have already stated my belief that chloral answers this purpose better.

Should Only be Given During the Pains.—There is one cardinal rule to be remembered in giving chloroform during the propulsive stage, and that is, that it should be administered intermittently, and never continuously. When the pain comes on a few drops may be scattered over a Skinner's inhaler, which affords one of the best means of administering it in labor, or placed within the folds of a handkerchief twisted into the form of a cone. During the acme of the pain the patient inhales it freely, and at once experiences a sense of great relief; and, as soon as the pain dies away, the inhaler should be removed. In the interval between the pains the effect of the drug passes off, so that the higher degree of anæsthesia should never be produced. Indeed, when properly given, consciousness should not be entirely abolished, and the patient, between the pains, should be able to speak, and understand what is said to her. This intermittent administration constitutes the peculiar safety of chloroform administered in labor, and it is a fortunate circumstance that, as yet, there is, I believe, no case on record of death during the inhalation of chloroform for obstetric purposes. This is obviously due to the effect of each inhalation passing off before a fresh dose is administered.

The effect on the pains should be carefully watched. If they become very materially lessened in force and frequency, it may be necessary to stop the inhalation for a short time, commencing again when the pains get stronger, which effect may be often completely and easily prevented by mixing the chloroform with about one-third of absolute alcohol, which, originally recommended, I believe, by Dr. Sansom, increases the stimulating effects of the chloroform, and

thus diminishes its tendency to produce undue relaxation. The amount administered must vary, of course, with the peculiarities of each individual case and the effect produced, but it need never be large. As the head distends the perineum, and the pains get very strong and forcing, it may be given more freely and to the extent of inducing even complete insensibility just before the child is born.

Ether as a Substitute for Chloroform.—In cases in which chloroform has lessened the force of the pains ether may be given instead with great advantage. It certainly often acts well when chloroform is inadmissible on account of its effects on the pains, and, so far as my experience goes, it has not the property of relaxing the uterus, but, on the contrary, has sometimes seemed to me distinctly to intensify the pains. Of late I have used a mixture of one part of absolute alcohol, two of chloroform, and three of ether. This is less disagreeable than ether, and has not the over-relaxing effects of chloroform.

Precautions.—Bearing in mind the tendency of chloroform to produce uterine relaxation, more than ordinary precautions should always be taken against post-partum hemorrhage in all cases in which it has been freely administered.

In cases of operative midwifery it is often given to the extent of producing complete anæsthesia. In all such cases it should be administered, when possible, by another medical man, and not by the operator, because the giving of chloroform to the surgical degree requires the undivided attention of the administrator, and no man can do this and operate at the same time. I once learnt an important lesson on this point. I had occasion to apply the forceps in the case of a lady who insisted on having chloroform. When commencing the operation I noticed some suspicious appearances about the patient, who was a large, stout woman, with a feeble circulation. I therefore stopped, allowed her to regain consciousness, and delivered her without anæsthesia, much to her own annoyance. Just one month after labor she went to a dentist to have a tooth extracted, and took chloroform, during the inhalation of which she died. This impressed on my mind the lesson that no man can do two things at the same time. The partial unconsciousness of incomplete anæsthesia, in which the patient is restless and tossing about, renders the application of forceps, as well as all other operations, very difficult. Therefore, unless the patient can be completely and fully anæsthetized, it is better to operate without chloroform being given at all.

SECTION V.

PELVIC PRESENTATIONS.

Under the head of *pelvic* presentations it is customary to include all cases in which any part of the lower extremities of the child presents. By some these are further subdivided into *breech*, *footling*, and *knee* presentations; but, although it is of consequence to be able to recognize the feet and the knee when they present, so far as the mechanism and management of delivery are concerned, the cases are identical, and, therefore, may be most conveniently considered together.

Frequency.—Presentations coming under this head are far from uncommon; those in which the breech alone occupies the pelvis are met with, according to Churchill, once in 52 labors, while Ramsbotham estimates that it presents more frequently, viz., once in 38.8 labors. Footling presentations occur only once in 92 cases. They are probably often the mere conversion of original breech presentations, the feet having come down during the labor, either in consequence of the sudden escape of the liquor amnii, when the breech was still freely movable above the brim, or from some other cause. Knee presentations are extremely rare, as may be readily understood if it be borne in mind that to admit them the thighs must be extended, hence the vertical measurement of the child must be greatly increased, and therefore it could not be readily accommodated within the uterine cavity, unless of unusually small size. As a matter of fact, Mme. La Chapelle found only one knee presentation in upwards of 3,000 cases.

Causes.—The causes of pelvic presentations are not known. They are probably the same as those which produce other varieties of mal-presentations; and it is not unlikely that, in certain women, there may be some peculiarity in the shape of the uterine cavity which favors their production. It would be difficult otherwise to explain such a case as that mentioned by Velpeau, in which the breech presented in six labors.

Prognosis.—The results, as regards the mother, are in no way more unfavorable than in vertex presentation. The first stage of the labor is generally tedious, since the large rounded mass of the breech does not adapt itself so well as the head to the lower segment of the uterus, and dilatation of the cervix is consequently apt to be retarded. The second stage is, however, if anything, more rapid than in vertex cases; and even when it is protracted, the soft breech does not produce such injurious pressure on the maternal structures as the hard and unyielding head.

The Infantile Mortality in Pelvic Presentations.—The result is very different as regards the child. Dubois calculated that 1 out of 11 children were still-born. Churchill estimates the mortality as much higher, viz., 1 in $3\frac{1}{8}$. The latter certainly indicates a larger number of still-births than is consistent with the experience of most practitioners, and more than should occur if the cases be properly managed; but there can be no doubt that the risk to the child is, even under the most favorable circumstances, very great. Even when the child is not lost it may be seriously injured. Dr. Rugè has tabulated a series of 29 cases in which there were found to be fractures of bones or other injuries.*

Causes of Fœtal Mortality.—The chief source of danger is pressure on the umbilical cord, in the interval elapsing between the birth of the body and the head. At this time the cord is very generally compressed between the head of the child and the pelvic walls, so that circulation in its vessels is arrested. Hence the aëration of the fœtal blood cannot take place; and, pulmonary respiration not having been yet established, the child dies asphyxiated. There are other conditions present which tend, although in a minor degree, to produce the same result. One of these is that the placenta is probably often separated by the uterine contractions when the bulk of the body is being expelled, as, indeed, takes place, under analogous circumstances, when the vertex presents; the necessary result being the arrest of placental respiration. Joulin thinks that the same effect may be produced by the compression of the placenta between the contracted uterus and the hard mass of the fœtal skull. Probably all these causes combine to arrest the functions of the placenta; and, if the delivery of the head, and consequently the establishment of pulmonary respiration, be delayed, the death of the child is almost inevitable. The corollary is that the danger to the child is in direct proportion to the length of time that elapses between the birth of the body and that of the head.

The risk to the child is greater in footling than in breech cases, because in the former the maternal structures are less perfectly dilated, in consequence of the small size of the feet and thighs, and, therefore, the birth of the head is more apt to be delayed.

Diagnosis.—Inasmuch as the long axis of the child corresponds with the long axis of the uterus, in pelvic as in vertex presentations, there is nothing in the shape of the uterus to arouse suspicion as to the character of the case. Still, it is often sufficiently easy to recognize a pelvic presentation by abdominal examination, if we have occasion to make one. The facility with which it may be done depends a good deal on the individual patient. If she be not very stout, and if the abdominal parietes be lax and non-resistant, we shall generally be able to feel the round head at the upper part of the uterus much firmer, and more defined in outline than the breech. The conclusion will be fortified if we hear the fœtal heart beating on a level with, or above, the umbilicus. The greater resistance on one side of the abdomen will also enable us

* Bul. Gén. de Thèrap., August, 1875.

to decide, with tolerable accuracy, to which side the back of the child is placed. Information thus acquired is, at the best, uncertain; and we can never be quite sure of the existence of a pelvic presentation until we can corroborate the diagnosis by vaginal examination.

Results of Vaginal Examination.—The first circumstance to excite suspicion on examination *per vaginam*, even when the os is undilated, is the absence of the hard globular mass felt through the lower segment of the uterus, which is so characteristic of vertex presentations. When the os is sufficiently open to allow the membranes to protrude, although the presenting part is too high up to be within reach, we may be struck with the peculiar shape of the bag of membranes, which, instead of being rounded, projects a considerable distance through the os, like the finger of a glove. This is a peculiarity met with in all malpresentations alike, and is, indeed, much less distinct in breech than in footling presentations, because in the former the membranes are more stretched, just as they are in vertex cases. When the membranes rupture, instead of the waters dribbling away by degrees, they often escape with a rush, in consequence of the pelvic extremity not filling up the lower part of the uterus so accurately as the head, which acts as a sort of ball-valve, and prevents the sudden and complete discharge of the waters.

Diagnosis of the Breech.—Often, on first examining, even when the membranes are ruptured, the presentation is too high up to be made out accurately. All that we can be certain of is, that it is not the head; and the case must be carefully watched, and examinations frequently repeated, until the precise nature of the presentation can be established. If the breech present, the finger first impinges on a round, soft prominence, on depressing which a bony protuberance, the trochanter major, can be felt. On passing the finger upwards it reaches a groove, beyond which a similar fleshy mass, the other buttock, can be felt. In this groove various characteristic points, diagnostic of the presentation, can be made out. Towards one end we can feel the movable tip of the coccyx, and above it the hard sacrum, with rough projecting prominences. These points, if accurately made out, are quite characteristic, and resemble nothing in any other presentation. In front there is the anus, in which it is sometimes, but by no means always, possible to insert the tip of the finger. If this can be done it is easy to distinguish it from the mouth, with which it might be confounded, by observing that the hard alveolar ridges are not contained within it. Still more in front we may find the genital organs, the scrotum in male children being often much swollen if the labor has been protracted. Thus it is often possible to recognize the sex of the child before birth.

Differential Diagnosis.—The breech might be mistaken for the face, especially if the latter be much swollen; but this mistake can readily be avoided by feeling the spinous processes of the sacrum.

The knee is recognized by its having two tuberosities with a depression between them. It might be confounded with the heel, the elbow, or the shoulder. From the heel, it is distinguished by having two tuberosities instead of one; from the elbow, by the latter having one sharp tuberosity, with a depression on each side, instead of a central depression and two lateral prominences; and from the shoulder, by the latter being more rounded, having only one prominence, running from which the acromion and clavicle can be traced.

Diagnosis of the Foot.—The foot may be mistaken for the hand. This error will be avoided by remembering that all the toes are in the same line, and that the great toe cannot be brought into apposition with the others, as the thumb can with the fingers. The internal border of the foot is much thicker than the external, whereas the two borders of the hand are of the same thickness. Moreover, the foot is articular at right angles to the leg, and cannot be brought into a line with it, as the hand can with the arm. Finally, the projection of the calcaneum is characteristic, and resembles nothing in the hand.

Mechanism.—As is the case in other presentations, obstetricians have very variously subdivided breech presentations, with the effect of needlessly complicating the subject. The simplest division, and that which will most readily impress itself on the memory of the student, is to describe the breech as presenting in four positions, analogous to those of the vertex, the sacrum being taken as representing the occiput, and the positions being numbered according to the part of the pelvis to which it points. Thus we have—

First, or left sacro-anterior (corresponding to the first position of the vertex). The sacrum of the child points to the left foramen ovale of the mother.

Second, or right sacro-anterior (corresponding to the second vertex position). The sacrum of the child points to the right foramen ovale of the mother.

Third, or right sacro-posterior (corresponding to the third vertex position). The sacrum of the child points to the right sacro-iliac synchondrosis of the mother.

Fourth, or left sacro-posterior (corresponding to the fourth vertex position). The sacrum of the child points to the left sacro-iliac synchondrosis of the mother.

Of these, as with the corresponding vertex positions, the first and third are the most common, their comparative frequency, no doubt, depending on the same causes. The mechanical conditions to which the presenting part is subjected are also identical, but the alterations of positions of the breech in its progress are by no means so uniform as those of the head, on account of its less perfect adaptation to the pelvic cavity. The mechanism of the delivery of the shoulders and head in breech presentations, moreover, is of much greater practical importance than that of the body in vertex presentations, inasmuch as the safety of the child depends on its speedy and satisfactory accomplishment. Bearing these facts in mind, it will suffice to describe briefly the phenomena of delivery in the first and third breech positions.

Position of the Child at Brim.—In the first position the sacrum of the child points to the left foramen ovale, its back is consequently placed to the left side of the uterus and anteriorly, and its abdomen looks to the right side of the uterus and posteriorly. The sulcus between the buttocks lies in the right oblique diameter of the pelvis, while the transverse diameter of the buttocks lies in the left oblique diameter, the left buttock being most easily within reach. As in vertex presentations, the hips of the child lie on the same level at the pelvic brim, although Naegele describes the left hip as placed lower than the right.

Descent.—As the pains act on the body of the child, the breech is gradually forced through the pelvic cavity, retaining the same relations as at the brim, its progress being generally more slow than that of the head, until it reaches the lower pelvic strait, when the same mechanism which produces rotation of the occiput comes to operate upon it. The result is a rotation of the child's pelvis, so that its transverse diameter comes to lie approximately in the antero-posterior diameter of the outlet, its antero-posterior diameter corresponds to the transverse diameter of the mother's pelvis, the left hip lies behind the pubis, and the right towards the sacrum. This rotation, which is admitted by the majority of obstetricians, is altogether denied by Naegele. There can be no doubt, however, that it does generally take place, but by no means so constantly as the corresponding rotation of the vertex; and it is not uncommon for it to be entirely absent, and for the hips to be born in the oblique diameter of the outlet. The body of the child is said frequently not to follow the movement imparted to the hips, so that there is more or less of a twist in the vertebral column.

Expulsion of the Hips and Body.—The left hip now becomes firmly fixed behind the pubis, and a movement of extension, analogous to that of the head in vertex presentations, takes place. The right, or posterior, hip revolves round the fixed one, gradually distends the perineum, and is expelled first, the left hip rapidly following. As soon as both hips are born, the feet slip out, unless the legs are completely extended upon the child's abdomen. The shoulders soon follow, lying in the left oblique diameter of

the pelvis. The left shoulder rotates forwards behind the pubis, where it becomes fixed, the right shoulder sweeping over the perineum, and being born first. The arms of the child are generally found placed upon its thorax, and are born before the shoulders. Sometimes they are extended over the child's head, thus causing considerable delay, and greatly increasing the risk to the child. It is now generally admitted that such extension is most apt to occur when traction has been made on the child's body with the view of hastening delivery, and that it is rarely met with when the expulsion of the body is left entirely to the natural powers.

Delivery of the Head.—When the shoulders are expelled the head enters the pelvis in the opposite, or right oblique diameter, the face looking to the right sacro-iliac synchondrosis. As the greater part of the child is now expelled, and as the head has entered the vagina, the uterus, having a comparatively small mass to contract upon, must obviously act at a mechanical disadvantage. Still the pressure of the head on the vagina is a powerful inciter, the accessory muscles of parturition are brought into strong action, and there is usually quite sufficient force to insure expulsion of the head without artificial aid. On account of the great resistance to the descent of the occiput from its articulation with the spinal column, the pains have the effect of forcing down the anterior portion of the head, and this insures the complete flexion of the chin upon the sternum. This is a great advantage from a mechanical point of view, as it causes the short occipito-mental diameter of the head to enter the pelvis in the axis of the uterus and the brim. If the head should be in a state of partial extension—as sometimes happens when the pelvis is unusually roomy—the occipital frontal diameter is placed in a similar relation to the brim, a position certainly less favorable to the easy birth of the head. As the head descends it experiences a movement of rotation, the occiput passing forwards and to the right, behind the pubic arch, the face turning backwards into the hollow of the sacrum. The body of the child will be observed to follow this movement, so that its back is turned towards the mother's abdomen, its anterior surface to the perineum. The nape of the neck now becomes firmly fixed under the arch of the pubis, the pains act chiefly on the anterior portion of the head, and cause it to sweep over the perineum, the chin being first born, then the mouth and forehead, and lastly the occiput.

Sacro-posterior Positions.—It is needless to describe the differences between the mechanism of the second and first positions, which the student, who has mastered the subject of vertex presentations, will readily understand. It is necessary, however, to say a few words as to sacro-posterior positions, choosing for that purpose the third, which is the more common of the two. This is exactly the opposite of the first position. The sacrum of the child points to the right sacro-iliac synchondrosis, its abdomen looks forward and to the left side of the mother. The transverse diameter of the child's pelvis lies in the left oblique diameter, the right hip being anterior. The birth of the body generally takes place exactly in the way that has been already described, the right hip being towards the pubis.

As the head descends into the pelvis the occiput most usually rotates along its right side—the rotation having been often already partially effected when that of the hips had been made—until it comes to rest behind the pubis, the face passing backwards along the left side of the pelvis into the hollow of the sacrum. This change corresponds exactly to the anterior rotation of the occiput in occipito-posterior positions, and is the natural and favorable termination.

Sometimes, forward rotation does not take place, and the occiput then turns backwards into the hollow of the sacrum. What then generally occurs is that the pains continue, for the reason already mentioned, to depress the chin and produce strong flexion of the face on the sternum, the occiput becoming fixed on the anterior border of the perineum. The pains continuing to act chiefly on the anterior part of the head, the face is born first behind the pubis, the occiput only slipping over the perineum after the forehead has been expelled.

Second Mode in which such Cases occasionally End.—A second mode of termination of such positions is mentioned in most works, on the authority of one or two recorded cases; but although mechanically possible, it is certainly an event of extreme rarity. The chin, instead of being flexed on the sternum, is greatly extended, so that the face of the child looks upwards towards the pelvic brim. The chin then hitches over the upper edge of the pubis and becomes fixed there, while the force of the uterine contractions is expended on the posterior part of the head, which descends through the pelvis, distending the perineum, and is born first, the face subsequently following.

Mechanism of Feet Presentation.—The mechanism of the delivery of the body and head in cases in which the feet originally present does not differ, in any important respect, from that which has been already described, and requires no separate notice.

Treatment.—From what has been said of the natural mechanism, it is evident that one of the most fruitful causes of difficulty and complication is undue interference on the part of the practitioner. It is, no doubt, tempting to use traction on the partially born trunk in the hope of expediting delivery; but when it is remembered that this is almost certain to produce extension of the arms above the head, and subsequently extension of the occiput on the spine, both of which seriously increase the difficulty of delivery, the necessity of leaving the case as much as possible to nature will be apparent.

Having once, therefore, determined the existence of a pelvic presentation, nothing more should be done until the birth of the breech. The membranes should be even more carefully prevented from prematurely rupturing than in vertex presentations, since they serve to dilate the genital passages better than the presenting part. Hence they should be preserved intact, if possible, until they reach the floor of the pelvis, instead of being punctured as soon as the os is fully dilated. The breech when born should be received and supported in the palm of the hand.

Danger to Child.—When the body is expelled as far as the umbilicus the dangers to the child commence: for now the cord is apt to be pressed between the body of the child and the pelvic walls. To obviate this risk as much as possible, a loop of the cord should be pulled down and carried to that part of the pelvis where there is most room, which will generally be opposite one or the other sacro-iliac synchondrosis. As long as the cord is freely pulsating we may be satisfied that the life of the child is not gravely imperilled, although delay is fraught with danger, from other sources which have been already indicated. In most cases the arms now slip out; but it may happen, even without any fault on the part of the accoucheur, that they are extended above the head, and it is of great importance that we should be thoroughly acquainted with the best means of liberating them from their abnormal position.

Management when the Arms are Extended above the Head.—They must, of course, never be drawn directly downwards, or the almost certain result would be fracture of the fragile bones. We should endeavor to make the arm sweep over the face and chest of the child, so that the natural movements of its joints should not be opposed. If the shoulders be within easy reach, the finger of the accoucheur should be slipped over that which is posterior—because there is likely to be more space for this manœuvre towards the sacrum—and gently carried downwards towards the elbow, which is drawn over the face, and then onwards, so as to liberate the forearm. The same manœuvre should then be applied to the opposite arm. It may be that the shoulders are not easily reached, and then they may be depressed by altering the position of the child's body. If this be carried well up to the mother's abdomen, the posterior shoulder will be brought lower down; and, by reversing this procedure and carrying the body back over the perineum, the anterior shoulder may be similarly depressed. It is only very exceptionally, however, that these expedients are required.

Birth of the Head.—The arms being extracted, some degree of artificial assistance is, at this time, almost always required. If there be much delay, the child will almost certainly perish. Attempts have been made, in cases in which delivery of the head could not be rapidly effected, to establish pulmonary respiration by passing one or two fingers into the vagina, so as to press it back and admit air to the child's mouth, or by passing a catheter or tube into the mouth. Neither of these expedients are reliable, and we should rather seek to aid nature in completing the birth of the head as rapidly as possible. The first thing to do, supposing the face to have rotated into the cavity of the sacrum, is to carry the body of the child well up towards the pubis and abdomen of the mother without applying any traction, for fear of interfering with the all-important flexion of the chin on the sternum. If now the patient bear down strongly, the natural powers may be sufficient to complete delivery. If there be any delay, traction must be resorted to, and we must endeavor to apply it in such a way as to insure flexion. For this purpose, while the body of the child is grasped by the left hand, and drawn upwards towards the mother's abdomen, the index and middle fingers of the right hand are placed on the back of the child's neck, so that their tips press on either side of the base of the occiput and push the head into a state of flexion. In most works we are advised to pass the index and middle fingers of the left hand at the same time over the child's face, so as to depress the superior maxilla. Dr. Barnes insists that this is quite unnecessary, and that extraction in the manner indicated, by pressure on the occiput, is quite sufficient. Should it not prove so, flexion of the chin may be very effectually assisted by downward pressure on the forehead through the rectum. One or two fingers of the left hand can readily be inserted into the bowel, and the expulsion of the head is thus materially facilitated.

Value of Pressure through the Abdomen.—By far the most powerful aid, however, in hastening delivery of the head, should delay occur, is pressure from above. This has been, strangely enough, almost altogether omitted by writers on the subject. It has been strongly recommended by Professor Penrose, and there can be no question of its utility. Indeed, as the uterus contracts tightly round the head, uterine expression can be applied almost directly to the head itself, and without any fear of deranging its proper relation to the maternal passages. It is very seldom, indeed, that a judicious combination of traction on the part of the accoucheur, with firm pressure through the abdomen applied by an assistant, will fail in effecting delivery of the head before the delay has had time to prove injurious to the child.

Application of the Forceps to the After-coming Head.—Many accoucheurs—among others Meigs and Rigby—advocate the application of the forceps when there is delay in the birth of the after-coming head. If the delay be due to want of expulsive force in a pelvis of normal size, manual extraction, in the manner just described, will be found to be sufficient in almost every case, and preferable, as being more rapid, easier of execution, and safer to the child. The forceps may be quite properly tried, if other means have failed; especially if there be some disproportion between the size of the head and the pelvis.

Management of Sacro-posterior Positions.—Difficulties in delivery may also occur in sacro-posterior positions. Up to the time of the birth of the head the labor usually progresses as readily as in sacro-anterior positions. If the forward rotation of the hips do not take place, much subsequent difficulty may be prevented by gently favoring it by traction applied to the breech during the pains, the finger being passed for this purpose into the fold of the groin.

It is after the birth of the shoulders that the absence of rotation is most likely to prove troublesome. It has been recommended that the body should then be grasped, in the interval between the pains, and twisted round so as to bring the occiput forward. It is by no means certain, however, that the head would follow the movement imparted to the body, and there must be a serious danger of giving a fatal twist of the neck by such a manœuvre. The better plan is to direct the face backwards, towards the cavity of the sacrum, by pressing on the anterior temple during the continuance of a pain. In this way the proper rotation will generally be effected without much difficulty, and the case will terminate in the usual way.

Management of Cases in which Forward Rotation does not Occur.—If rotation of the occiput forwards do not occur, it is necessary for the practitioner to bear in mind the natural mechanism of delivery under such circumstances. In the majority of cases the proper plan is to favor flexion of the chin by upward pressure on the occiput, and to exert traction directly backwards, remembering that the nape of the neck should be fixed against the anterior margin of the perineum. If this be not remembered, and traction be made in the axis of the pelvic outlet, the delivery of the head will be seriously impeded. In the rare cases in which the head becomes extended, and the chin hitches on the upper margin of the pubis, traction directly forwards and upwards may be required to deliver the head; but before resorting to it care should be taken to ascertain that backward extension of the head has really taken place.

Management of Impacted Breech Presentations.—It remains for us to consider the measures which may be adopted in those very troublesome cases in which the breech refuses to descend, and becomes impacted in the pelvic cavity, either from uterine inertia or from disproportion between the breech and the pelvis. Here, unfortunately, the peculiar shape of the presenting part, which is unadapted for the application of the forceps, renders such cases very difficult to manage.

Two measures have been chiefly employed: 1st, bringing down one or both feet, so as to break up the presenting part, and convert it into a footling case; 2d, traction on the breech, either by the fingers, a blunt hook, or fillet passed over the groin.

Barnes insists on the superiority of the former plan, and there can be no question that, if a foot can be got down, the accoucheur has a complete control over the progress of the labor, which he can gain in no other way. If the breech be arrested at or near the brim, there will generally be no great difficulty in effecting the desired object. It will be necessary to give chloroform to the extent of complete anæsthesia, and to pass the hand over the child's abdomen in the same manner, and with the same precautions, as in performing podalic version, until a foot is reached, which is seized and pulled down. If the feet be placed in the usual way close to the buttocks, no great difficulty is likely to be experienced. If, however, the legs be extended on the abdomen, it will be necessary to introduce the hand and arm very deeply, even up to the fundus of the uterus, a procedure which is always difficult, and which may be very hazardous. Nor do I think that the attempt to bring down the feet can be safe when the breech is low down and fixed in the pelvic cavity. A certain amount of repression of the breech is possible, but it is evident that this cannot be safely attempted when the breech is at all low down.

Traction on the Groin.—Under such circumstances traction is our only resource, and this is always difficult and often unsatisfactory. Of all contrivances for this purpose none is better than the hand of the accoucheur. The index finger can generally be slipped over the groin without difficulty, and traction can be applied during the pains. Failing this, or when it proves insufficient, an attempt should be made to pass a fillet over the groins. A soft silk handkerchief, or a skein of worsted, answers best, but it is by no means easy to apply. The simplest plan, and one which is far better than the expensive instruments contrived for the purpose, is to take a stout piece of copper wire and bend it double into the form of a hook. The extremity of this can generally be guided over the hips, and through its looped end the fillet is passed. The wire is now withdrawn, and carries the fillet over the groins. I have found this simple contrivance, which can be manufactured in a few moments, very useful, and by means of such a fillet very considerable tractive force can be employed. The use of a soft fillet is in every way preferable to the blunt hook which is contained in most obstetric bags. A hard instrument of this kind is quite as

difficult to apply, and any strong traction employed by it is almost certain to seriously injure the delicate fœtal structures over which it is placed. As an auxiliary the employment of uterine expression should not be forgotten, since it may give material aid when the difficulty is only due to uterine inertia. After a difficult breech labor is completed the child should be carefully examined to see that the bones of the thighs and arms have not been injured. Fractures of the thigh are far from uncommon in such cases, and the soft bones of the newly born child will readily and rapidly unite if placed at once in proper splints.

Embryotomy.—Failing all endeavors to deliver by these expedients, there is no resource left but to break up the presenting part by scissors, or by craniotomy instruments; but fortunately so extreme a measure is but rarely necessary.

SECTION VI.

PRESENTATIONS OF THE FACE.

Presentations of the face are by no means rare; and, although in the great majority of cases they terminate satisfactorily by the unassisted powers of nature, yet every now and again they give rise to much difficulty, and then they may be justly said to be amongst the most formidable of obstetric complications. It is, therefore, essential that the practitioner should thoroughly understand the natural history of this variety of presentation, with the view of enabling him to intervene with the best prospect of success.

Erroneous Views Formerly Held on the Subject.—The older accoucheurs held very erroneous views as to the mechanism and treatment of these cases, most of them believing that delivery was impossible by the natural efforts, and that it was necessary to intervene by version in order to effect delivery. Smellie recognized the fact that spontaneous delivery is possible, and that the chin turns forwards and under the pubis; but it was not until long after his time, and chiefly after the appearance of Mme. La Chapelle's essay on the subject, that the fact that most cases could be naturally delivered was fully admitted and acted upon.

Frequency.—The frequency of face presentations varies curiously in different countries. Thus, Collins found that in the Rotunda Hospital there was only 1 case in 497 labors, although Churchill gives 1 in 249 as the average frequency in British practice; while in Germany this presentation is met with once in 169 labors. The only reasonable explanation of this remarkable difference is, that the dorsal decubitus, generally followed abroad, favors the transformation of vertex presentations into those of the face.

The mode in which this change is effected—for it can hardly be doubted that, in the large majority of cases, face presentation is due to a backward displacement of the occiput after labor has actually commenced, but before the head has engaged in the brim—has been made the subject of various explanations.

Mode in which Face Presentations are Produced.—It has generally been supposed that the change is induced by a hitching of the occiput on the brim of the pelvis, so as to produce extension of the head, and descent of the face; the occurrence being favored by the oblique position of the uterus so frequently met with in pregnancy. Hecker attaches considerable importance to a peculiarity in the shape of the fœtal head generally observed in face presentations, the cranium having the dolicho-cephalous form, prominent posteriorly, with occiput projecting, which has the effect of increasing the length of the posterior cranial lever arm, and facilitating extension when circumstances favoring it are in action. Dr. Duncan* thinks that uterine obliquity has much influence in the production of face presentation, but in a different way from that above referred to. He points out that, when obliquity is very marked, a curve in the genital passages is produced, the convexity of which is directed to the side towards which the uterus is deflected. When uterine contraction commences, the fœtus is propelled downwards, and the cavity of the curve is acted on to the greatest advantage by the propelling force, and tends to descend. Should the occiput happen to lie in the convexity of the curve so formed, the tendency will be for the forehead to descend. In the majority of cases its descent will be prevented by the increased resistance it meets with, in consequence of the greater length of the anterior cranial lever arm; but if the uterine obliquity be extreme, this may be counterbalanced, and a face presentation ensues. The influence of this obliquity is corroborated by the observation of Baudelocque, that the occiput in face presentations almost invariably corresponds to the side of the uterine obliquity. A further corroboration is afforded by the fact, that in face presentation the occiput is much more frequently directed to the right than to the left; while right lateral obliquity of the uterus is also much more common.

These theories assume that face presentations are produced during labor. In a few cases they certainly exist before labor has commenced. It is possible, however, as we know that uterine contractions exist independently of actual labor, that similar causes may also be in operation, although less distinctly, before the commencement of labor.

Diagnosis.—The diagnosis is often a matter of considerable difficulty at an early period of labor, before the os is fully dilated and the membranes ruptured, and when the face has not entered the pelvic cavity. The finger then impinges on the rounded mass of the forehead, which may very readily be mistaken for the vertex. At this stage the diagnosis may be facilitated by abdominal palpation in the way suggested by Hecker. If the face is presenting at the brim, palpation will enable us to distinguish a hard, firm, and rounded body, immediately above the pubis, which is the forehead and sinciput; on the other side will be felt an indistinct soft substance, corresponding to the thorax and neck. When labor is advanced, and the head has somewhat descended, or when the membranes are ruptured, we should be able to make out the nature of the presentation with certainty. The diagnostic marks to be relied on are the edges of the orbits, the prominence of the nose, the nostrils (their orifices showing to which part of the pelvis the chin is turned), and the cavity of the mouth, with the alveolar ridges. If these be made out satisfactorily, no mistake should occur. The most difficult cases are those in which the face has been a considerable time in the pelvis. Under such circumstances the cheeks become greatly swollen and pressed together, so as to resemble the nates. The nose might then be mistaken for the genital organs, and the mouth for the anus. The orbits, however, and the alveolar ridges, resemble nothing in the breech, and should be sufficient to prevent error. Considerable care should be taken not to examine too frequently and roughly, otherwise serious injury to the delicate structures of the face might be inflicted. When once the presentation has been satisfactorily diagnosed, examinations should be made as seldom as possible, and only to assure ourselves that the case is progressing satisfactorily.

Mechanism.—If we regard face presentations, as we are fully justified in doing, as being generally produced by the extension of the occiput in what were originally vertex presentations, we can readily understand that the position of the face in relation to the pelvis must correspond to that of the vertex. This is, in fact, what is found to be the case, the forehead occupying the position in which the occiput would have been placed had extension not occurred.

The Positions of the Face Correspond to those of the Vertex.—The face, then, like the head, may be placed with its long diameter corresponding to almost any of the diameters of the brim, but most generally it lies either in the transverse diameter, or between this and the oblique, while, as it descends in the pelvis, it more generally occupies one or other of the oblique diameters. It is common in obstetric works to describe two principal varieties of face presentation, viz., the right and left mento-iliac, according as the chin is turned to one or other side of the pelvis. It is better, however, to classify the positions in accordance with the part of the pelvis to which the chin points. We may, therefore, describe

* Edin. Med. Journ., vol. xv.

four positions of the face, each being analogous to one of the ordinary vertex presentations, of which it is the transformation.

First Position.—The chin points to the right sacro-iliac synchondrosis, the forehead to the left foramen ovale, and the long diameter of the face lies in the right oblique diameter of the pelvis. This corresponds to the first position of the vertex, and, as in that, the back of the child lies to the left side of the mother.

Second Position.—The chin points to the left sacro-iliac synchondrosis, the forehead to the right foramen ovale, and the long diameter of the face lies in the left oblique diameter of the pelvis. This is the conversion of the second vertex position.

Third Position.—The forehead points to the right sacro-iliac synchondrosis, the chin to the left foramen ovale, and the long diameter of the face lies in the right oblique diameter of the pelvis. This is the conversion of the third vertex position.

Fourth Position.—The forehead points to the left sacro-iliac synchondrosis, the chin to the right foramen ovale, and the long diameter of the face lies in the left oblique diameter of the pelvis. This is the conversion of the fourth vertex position.

Relative Frequency of these Positions.—The relative frequency of these presentations is not yet positively ascertained. It is certain that there is not the preponderance of first facial that there is of first vertex positions, and this may, no doubt, be explained by the supposition that an unusual vertex position may of itself facilitate the transformation into a face presentation. Winckel concludes that, *cæteris paribus*, a face presentation is more readily produced when the back of the child lies to the right than when it lies to the left side of the mother; the reason for this being probably the frequency of right lateral obliquity of the uterus. We shall presently see that, with very rare exceptions, it is absolutely essential that the chin should rotate forwards under the pubis before delivery can be accomplished; and, therefore, we may regard the third and fourth face positions, in which the chin from the first points anteriorly, as more favorable than the first and second.

Mechanism.—The mechanism of delivery in face is practically the same as in vertex presentations; and we shall have no difficulty in understanding it if we bear in mind that in face cases the forehead takes the place and represents the occiput in vertex presentations. For the purpose of description we will take the first position of the face—

Description of Delivery in the First Position of the Face.—1. The first step consists in the *extension* of the head, which is effected by the uterine contractions as soon as the membranes are ruptured. By this the occiput is still more completely pressed back on the nape of the neck, and the fronto-mental, rather than the mento-bregmatic, diameter is placed in relation to the pelvic brim. This corresponds to the stage of flexion in vertex presentations.

The chin descends below the forehead, from precisely the same cause as the occiput in vertex presentations. On account of the extended position of the head the presenting face is divided into portions of unequal length in relation to the vertebral column, through which the force is applied, the longer lever arm being towards the forehead. The resistance is, therefore, greatest towards the forehead, which remains behind while the chin descends.

2. *Descent.*—As the pains continue, the head (the chin being still in advance) is propelled through the pelvis. It is generally said that the face cannot descend, like the occiput, down to the floor of the pelvis, its descent being limited by the length of the neck. There is here, however, an obvious misapprehension. The neck, from the chin to the sternum, when the head is forcibly extended, measures from 3½ to 4 inches, a length that is more than sufficient to admit of the face descending to the lower pelvic strait. As a matter of fact, the chin is frequently observed in mento-posterior positions to descend so far that it is apparently endeavoring to pass the perineum before rotation occurs. At the brim the two sides of the face are on a level, but as labor advances, the right cheek descends somewhat, the caput succedaneum forms on the malar bone, and, if a secondary caput succedaneum form, on the cheek.

3. *Rotation* is by far the most important point in the mechanism of face presentations: for, unless it occurs, delivery, with a full-sized head and an average pelvis, is practically impossible. There are, no doubt, exceptions to this rule, which must be separately considered, but it is certain that the absence of rotation is always a grave and formidable complication of face presentation. Fortunately it is only very rarely that it is not effected. The mechanical causes are precisely those which produce rotation of the occiput forwards in vertex presentations. As it is accomplished, the chin passes under the arch of the pubis, and the occiput rotates into the hollow of the sacrum; and then commences—

4. *Flexion*, a movement which corresponds to extension in vertex cases. The chin passes as far as it can under the pubic arch, and there becomes fixed. The uterine force is now expended on the occiput which revolves, as it were, on its transverse axis, the under surface of the chin resting on the pubis at a fixed point. This movement goes on until, at last, the face and occiput sweep over the distended perineum.

5. *External Rotation* is precisely similar to that which takes place in head presentations, and, like it, depends on the movements imparted to the shoulders.

Such is the natural course of delivery in the vast majority of cases; but, in order fully to understand the subject, it is necessary to study those rare cases in which the chin points backwards, and forward rotation does not occur. These may be taken to correspond to the occipito-posterior positions, in which the face is born looking to the pubes; but unlike them, it is only very exceptionally that delivery can be naturally completed. The reason of this is obvious, for the occiput gets jammed behind the pubis, and there is no space for the fronto-mental diameter to pass the antero-posterior diameter of the outlet. Cases are indeed recorded in which delivery has been effected with the chin looking posteriorly; but there is every reason to believe that this can only happen when the head is either unusually small, or the pelvis unusually large. In such cases the forehead is pressed down until a portion appears at the ostium vaginæ, when it becomes firmly fixed behind the pubis, and the chin, after many efforts, slips over the perineum. When this is effected, flexion occurs, and the occiput is expelled without difficulty. The forehead is probably always on a lower level than the chin.

Dr. Hicks* has published a paper in which he attempts to show that this termination of face presentations is not so rare as is generally supposed, and he gives a single instance in which he effected delivery with the forceps; but he practically admits that special conditions are necessary, such as the "antero-posterior diameter of the outlet particularly ample," and a diminished size of the head. When delivery is effected it is probable, as Cazeaux has pointed out, that the face lies in the oblique diameter of the outlet, and that the chin depresses the soft structures at the side of the sacro-ischiatic notch, which yield to the extent of a quarter of an inch or more, and thereby permit the passage of the occipito-mental diameter of the head. It must, however, be borne well in mind that spontaneous delivery in mento-posterior positions is the rare exception, and that supposing rotation does not occur—and it often does so at the last moment—artificial aid in one form or another will be almost certainly required.

Prognosis of Face Presentations.—As regards the mother, in the great majority of cases the prognosis is favorable, but the labor is apt to be prolonged, and she is, therefore, more exposed to the risks attending tedious delivery. As regards the child, the prognosis is much more unfavorable than in vertex presentations. Even when the anterior rotation of the chin takes place in the natural way, it is estimated that 1 out of 10 children is stillborn; while if not, the death of the child is almost certain. This increased infantile mortality is evidently due to the serious amount of pressure to which the child is subjected, and probably depends in many cases on cerebral congestion, produced by pressure on the jugular

*Obst. Trans., vol. vii.

veins, as the neck lies in the pelvic cavity. Even when the child is born alive, the face is always greatly swollen and disfigured. In some cases the deformity produced in this way is excessive, and the features are often scarcely recognizable. This disfiguration passes away in a few days; but the practitioner should be aware of the probability of its occurrence, and should warn the friends, or they might be unnecessarily alarmed, and possibly might lay the blame on him.

Treatment.—After what has been said as to the mechanism of delivery in face presentation, it is obvious that the proper course is to leave the case alone, in the expectation of the natural efforts being sufficient to complete delivery. Fortunately, in the large majority of cases, this course is attended by a successful result.

The older accoucheurs, as has been stated, thought active interference absolutely essential, and recommended either podalic version, or the attempt to convert the case into a vertex presentation, by inserting the hand and bringing down the occiput. The latter plan was recommended by Baudelocque, and is even yet followed by some accoucheurs. Thus Dr. Hodge* advises it in all cases in which face presentation is detected at the brim; but although it might not have been attended with evil consequences in his experienced hands, it is certainly altogether unnecessary, and would infallibly lead to most serious results if generally adopted. It may, however, be allowable in certain cases in which the face remains above the brim, and refuses to descend into the pelvic cavity. Even then it is questionable whether podalic version should not be preferred, as being easier of performance, giving, when once effected, a much more complete control over delivery, and being less painful to the mother. Version is certainly preferable to the application of the forceps, which are introduced with difficulty in so high a position of the face, and do not take a secure hold.

When once the face has descended into the pelvis difficulties may arise from two chief causes: uterine inertia, and non-rotation forwards of the chin.

The treatment of the former class must be based on precisely the same general principles as in dealing with protracted labor in vertex presentations. The forceps may be applied with advantage, bearing in mind the necessity of getting the chin under the pubis, and, when this has been effected, of directing the traction forwards, so as to make the occiput slowly and gradually distend and sweep over the perineum.

Difficulties Arising from Non-rotation of Chin Forwards.—The second class of difficult face cases are much more important, and may try the resources of the accoucheur to the utmost. Our first endeavor must be, if possible, to secure the anterior rotation of the chin. For this purpose various manœuvres are recommended. By some, we are advised to introduce the finger cautiously into the mouth of the child, and draw the chin forwards during a pain; by others, to pass the finger up behind the occiput and press it backwards during the pain. Schroeder points out that the difficulty often depends on the fact of the head not being sufficiently extended, so that the chin is not on a lower level than the forehead; and that rotation is best promoted by pressing the forehead upwards with the finger during a pain, so as to cause the chin to descend. Penrose† believes that non-rotation is generally caused by the want of a *point d'appui* below, on account of the face being able to descend to the floor of the pelvis, and that, if this is supplied, rotation will take place. In such cases he applies the hand, or the blade of the forceps, so as to press on the posterior cheek. By this means the necessary *point d'appui* is given; and he relates several interesting cases in which this simple manœuvre was effectual in rapidly terminating a previously lengthy labor. Any, or all, of these plans may be tried. We must bear in mind, in using them, that rotation is often delayed until the face is quite at the lower pelvic strait, so that we need not too soon despair of its occurring. If, however, in spite of these manœuvres, it do not take place, what is to be done? If the head be not too low down in the pelvis to admit of version, that would be the simplest and most effectual plan. I have succeeded in delivering in this way when all attempts at producing rotation had failed; but generally the face will be too decidedly engaged to render it possible. An attempt might be made to bring down the occiput by the vectis, or by a fillet; but if the face be in the pelvic cavity, it is hardly possible for this plan to succeed. An endeavor may be made to produce rotation by the forceps; but it should be remembered that rotation of the face mechanically in this way is very difficult, and much more likely to be attended with fatal consequences to the child than when it is effected by the natural efforts. In using forceps for this purpose, the second or pelvic curve is likely to prove injurious, and a short, straight instrument is to be preferred. If rotation be found to be impossible, an endeavor may be made to draw the face downwards, so as to get the chin over the perineum, and deliver in the mento-posterior position; but, unless the child be small, or the pelvis very capacious, the attempt is unlikely to succeed. Finally, if all these means fail, there is no resource left but lessening the size of the head by craniotomy, a *dernier ressort* which, fortunately, is very rarely required.

Brow Presentations.—It sometimes happens that the head is partially extended, so as to bring the os frontis into the brim of the pelvis, and form what is described as a "*brow presentation.*" Should the head descend in this manner, the difficulties, although not insuperable, are apt to be very great, from the fact that the long cervico-frontal diameter of the head is engaged in the pelvic cavity. The diagnosis is not difficult, for the os frontis will be detected by its rounded surface; while the anterior fontanelle is within reach in one direction, the orbit, and root of the nose, in another.

Spontaneously Converted into either Face or Vertex Presentations.—Fortunately, in the large majority of cases brow presentations are spontaneously converted into either vertex or face presentations, according as flexion or extension of the head occurs; and these must be regarded as the desirable terminations and the ones to be favored. For this purpose upward pressure must be made on one or other extremity of the presenting part during a pain, so as to favor flexion, or extension; or, if the parts be sufficiently dilated, an attempt may be made to pass the hand over the occiput and draw it down, thus performing cephalic version. The latter is the plan recommended by Hodge, who describes the operation as easy. It is questionable, however, if a well-marked brow presentation be distinctly made out while the head is still at the brim, whether podalic version would not be the easiest and best operation. If the forehead have descended too low for this, and if the endeavor to convert it into either a face or vertex presentation fail, the forceps will, probably, be required. In such cases the face generally turns towards the pubes, the superior maxilla becomes fixed behind the pubic arch, and the occiput sweeps over the perineum. Very great difficulty is likely to be experienced, and if conversion into either a vertex or face presentation cannot be effected, craniotomy is not unlikely to be required.

SECTION VII.

DIFFICULT OCCIPITO-POSTERIOR POSITIONS.

A few words may be said in this place as to the management of occipito-posterior positions of the head, especially of those in which forward rotation of the occiput does not take place. It has already been pointed out that, in the large majority of these cases, the occiput rotates forward without any particular difficulty, and the labor terminates in the usual way, with the occiput emerging under the arch of the pubis.

Rotation Forwards of the Occiput.—In a certain number of cases such rotation does not occur, and difficulty and delay are apt to follow. The proportion of cases in which face to pubis terminations of occipito-posterior positions occur has been variously estimated; and they are certainly more common than most of our

* System of Obstetrics, p. 335.

† Amer. Supplement to Obst. Journ., April, 1876.

text-books lead us to expect. Dr. Uvedale West,* who studied the subject with great care, found that labor ended in this way in 79 out of 2,585 births, all these deliveries being exceptionally difficult.

Causes of Face to Pubis Delivery.—He believed that forward rotation of the head is prevented by the absence of flexion of the chin on the sternum, so that the long occipito-frontal, instead of the short sub-occipito-bregmatic, diameter of the head is brought into contact with the pelvic diameter; hence the occiput is no longer the lowest point, and is not subjected to the action of those causes which produce forward rotation. Dr. Macdonald, who has written a thoughtful paper on the subject,† believes that the non-rotation forward of the occiput is chiefly due to the large size of the head, in consequence of which "the forehead gets so wedged into the pelvis anteriorly that its tendency to slacken and rotate forward does not come into play." Dr. West's explanation, which has an important bearing on the management of these cases, seems to explain most correctly the non-occurrence of the natural rotation.

The important question for us to decide is, how can we best assist in the management of cases of this kind when difficulties arise, and labor is seriously retarded?

Mode of Treatment.—Dr. West, insisting strongly on the necessity of complete flexion of the chin on the sternum, advises that this should be favored by upward pressure on the frontal bone, with the view of causing the chin to approach the sternum, and the occiput to descend, and thus to come within the action of the agencies which favor rotation. Supposing the pains to be strong, and the fontanelle to be readily within reach, we may, in this way, very possibly favor the descent of the occiput; and without injuring the mother, or increasing the difficulties of the case in the event of the manœuvre failing. The beneficial effects of this simple expedient are sometimes very remarkable. In two cases in which I recently adopted it, labor, previously delayed for a length of time without any apparent progress, although the pains were strong and effective, was in each instance rapidly finished almost immediately after the upward pressure was applied. The rotation of the face backwards may at the same time be favored by pressure on the pubic side of the forehead during the pains.

Traction on the Occiput.—Others have advised that the descent of the occiput should be promoted by downward traction, applied by the vectis or fillet. The latter is the plan specially advocated by Hodge;‡ and the fillet certainly finds one of its most useful applications in cases of this kind, as being simpler of application, and probably more effective than the vectis.

Over-active Endeavors at Assistance should be Avoided.—Although any of these methods may be adopted, a word of caution is necessary against prolonged and over-active endeavors at producing flexion and rotation when that seems delayed. All who have watched such cases must have observed that rotation often occurs spontaneously at a very advanced period of labor, long after the head has been pressed down for a considerable time to the very outlet of the pelvis, and when it seems to have been making fruitless endeavors to emerge; so that a little patience will often be sufficient to overcome the difficulty.

When Necessary the Forceps may be Used.—In the event of assistance being absolutely required, there is no reason why the forceps should not be used. The instrument is not more difficult to apply than under ordinary circumstances, nor, as a rule, is much more traction necessary. Dr. Macdonald, indeed, in the paper already alluded to, maintains that in persistent occipito-posterior positions there is almost always a want of proportion between the head and the pelvis, and that, therefore, the forceps will be generally required, and he prefers them to any artificial attempts at rectification. Some peculiarities in the mode of delivery are necessary to bear in mind. In most works it is taught, that the operator should pay special attention to the rotation of the head, and should endeavor to impart this movement by turning the occiput forward during extraction. Thus Tyler Smith says, "In delivery with the forceps in occipito-posterior presentations, the head should be slowly rotated during the process of extraction so as to bring the vertex towards the pubic arch, and thus convert them into occipito-anterior presentations." The danger accompanying any forcible attempt at artificial rotation will, however, be evident on slight consideration. It is true that in many cases, when simple traction is applied, the occiput will, of itself, rotate forwards, carrying the instrument with it. But that is a very different thing from forcibly twisting round the head with the blades of the forceps, without any assurance that the body of the child will follow the movement. It is impossible to conceive that such violent interference should not be attended with serious risk of injury to the neck of the child. If rotation do not occur, the fair inference is, that the head is so placed as to render delivery with the face to the pubis the best termination, and no endeavor should be made to prevent it. This rule of leaving the rotation entirely to nature, and using traction only, has received the approval of Barnes and most modern authorities, and is the one which recommends itself as the most scientific and reasonable.

Objection to Curved Instruments in such Cases.—These are cases in which the pelvic curve of the forceps is of doubtful utility. When applied in the usual way the convexity of the blades points backwards. If rotation accompany extraction, the blades necessarily follow the movement of the head, and their convex edges will turn forwards. It certainly seems probable that such a movement would subject the maternal soft parts to considerable risk. I have, however, more than once seen such rotation of the instrument happen without any apparent bad result; but the dangers are obvious. Hence it would be a wise precaution either to use a pair of straight forceps for this particular operation, or to remove the blades and leave the case to be terminated by the natural powers, when the head is at the lower strait, and rotation seems about to occur. When there is no rotation, more than usual care should be taken with the perineum, which is necessarily much stretched by the rounded occiput. Indeed the risk to the perineum is very considerable, and, even with the greatest care, it may be impossible to avoid laceration.

Bearing these precautions in mind, delivery with the forceps in occipito-posterior positions offers no special difficulties or dangers.

SECTION VIII.

PRESENTATIONS OF THE SHOULDER, ARM, OR TRUNK—COMPLEX PRESENTATIONS—PROLAPSE OF THE FUNIS.

In the presentations already considered the long diameter of the fœtus corresponded with that of the uterine cavity, and, in all of them, the birth of the child by the maternal efforts was the general and normal termination of labor. We have now to discuss those important cases in which the long diameter of the fœtus and uterus do not correspond, but in which the long fœtal diameter lies obliquely across the uterine cavity. In the large majority of these it is either the shoulder or some part of the upper extremity that presents; for it is an admitted fact that although other parts of the body, such as the back, or abdomen, may, in exceptional cases, lie over the os at an early period of labor, yet, as labor progresses, such presentations are almost always converted into those of the upper extremity.

For all practical purposes we may confine ourselves to a consideration of *shoulder* presentations; the further subdivision of these into *elbow* or *hand* presentations being no more necessary than the division of pelvic presentations into breech, knee, and footling cases, since the mechanism and management are identical, whatever part of the upper extremity presents.

Delivery by the Natural Powers is quite Exceptional.—There is this great distinction between the presentations we are now considering and those already treated of, that, on account of the rela-

* Cranial Presentations, p. 33. † Edin. Med. Journ., Oct., 1874.
‡ System of Obstetrics, p. 308.

tions of the fœtus to the pelvis, delivery by the natural powers is impossible, except under special and very unusual circumstances that can never be relied upon. Intervention on the part of the accoucheur is, therefore, absolutely essential, and the safety of both the mother and child depends upon the early detection of the abnormal position of the fœtus; for the necessary treatment, which is comparatively easy and safe before labor has been long in progress, becomes most difficult and hazardous if there have been much delay.

Position of the Fœtus.—Presentations of the upper extremity or trunk are often spoken of as "*transverse presentations*" or "*cross births;*" but both of these terms are misleading, as they imply that the fœtus is placed transversely in the uterine cavity, or that it lies directly across the pelvic brim. As matter of fact, this is never the case, for the child lies obliquely in the uterus, not indeed in its long axis, but in one intermediate between its long and transverse diameters.

Divided into Dorso-anterior and Dorso-posterior Positions.—Two great divisions of shoulder presentations are recognized; the one in which the back of the child looks to the abdomen of the mother, and the other in which the back of the child is turned towards the spine of the mother. Each of these is subdivided into two subsidiary classes, according as the head of the child is placed in the right or left iliac fossa. Thus in dorso-anterior positions, if the head lie in the left iliac fossa, the right shoulder of the child presents; if in the right iliac fossa, the left. So in dorso-posterior positions, if the head lie in the left iliac fossa, the left shoulder presents; if in the right, the right. Of the two classes the dorso-anterior positions are more common, in the proportion, it is said, of two to one.

Causes.—The causes of shoulder presentation are not well known. Amongst those most commonly mentioned are prematurity of the fœtus, and excess of liquor amnii; either of these, by increasing the mobility of the fœtus in utero, would probably have considerable influence. The fact that it occurs much more frequently amongst premature births has long been recognized. Undue obliquity of the uterus has probably some influence, since the early pains might cause the presenting part to hitch against the pelvic brim, and the shoulder to descend. An unusually low attachment of the placenta to the inferior segment of the uterine cavity has been mentioned as a predisposing cause. In consequence of this the head does not lie so readily in the lower uterine segment, and is apt to slip up into one of the iliac fossæ. This is supposed to explain the frequency of arm presentation in cases of partial or complete placenta prævia. Danyou and Wigand believe that shoulder presentations are favored by irregularity in the shape of the uterine cavity, especially a relative increase in its transverse diameter. This theory has been generally discredited by writers, and it is certainly not susceptible of proof; but it seems far from unlikely that some peculiarity of shape may exist, not capable of recognition, but sufficient to influence the position of the fœtus. How otherwise are we to explain those remarkable cases, many of which are recorded, in which similar malpositions occurred in many successive labors? Thus Joulin refers to a patient who had an arm presentation in three successive pregnancies, and to another who had shoulder presentation in three out of four labors. Certainly, such constant recurrences of the same abnormality could only be explained on the hypothesis of some very persistent cause, such as that referred to. Pinard * states that shoulder presentations are seven times more common in multiparæ than in primiparæ, in consequence, as he believes, of the laxity of the abdominal walls in the former, which allows the uterus to fall forwards, and thus prevents the head entering the pelvic brim in the latter weeks of pregnancy. It is probable that merely accidental causes have most influence in the production of shoulder presentation, such as falls, or undue pressure exerted on the abdomen by badly fitting or tight stays. Partially transverse positions during pregnancy are certainly much more common than is generally believed, and may often be detected by abdominal palpation. The tendency is for such malpositions to be righted either before labor sets in, or in the early period of labor; but it is quite easy to understand how any persistent pressure, applied in the manner indicated, may perpetuate a position which otherwise would have been only temporary.

Prognosis and Frequency.—According to Churchill's statistics, shoulder presentations occur about once in 260 cases; that is only slightly less frequently than those of the face. The prognosis to both the mother and child is much more unfavorable; for he estimates that out of 235 cases 1 in 9 of the mothers and half the children were lost. The prognosis in each individual case will, of course, vary much with the period of delivery at which the malposition is recognized. If detected early, interference is easy, and the prognosis ought to be good; whereas there are few obstetric difficulties more trying than a case of shoulder presentation, in which the necessary treatment has been delayed until the presenting part has been tightly jammed into the cavity of the pelvis.

Diagnosis.—Bearing this fact in mind, the paramount necessity of an accurate diagnosis will be apparent; and it is specially important that we should be able not only to detect that a shoulder or arm is presenting, but that we should, if possible, determine which it is, and how the body and head of the child are placed. The existence of a shoulder presentation is not generally suspected, until the first vaginal examination is made during labor. The practitioner will then be struck with the absence of the rounded mass of the fœtal head, and, if the os be open and the membranes protruding, by their elongated form, which is common to this and to other malpresentations. If the presenting part be too high to reach, as is often the case at an early period of labor, an endeavor should at once be made to ascertain the fœtal position by abdominal examination. This is the more important, as it is much more easy to recognize presentations of the shoulder in this way than those of the breech or foot; and, at so early a period, it is often not only possible, but comparatively easy, to alter the position of the fœtus by abdominal manipulation alone, and thus avoid the necessity of the more serious form of version. The method of detecting a shoulder presentation by examination of the abdomen has already been described, and need not be repeated. The chief points to look for are, the altered shape of the uterus, and two solid masses, the head and the breech, one in either iliac fossa. The facility with which these parts may be recognized varies much in different patients. In thin women, with lax abdominal parietes, they can be easily felt; while in very stout women, it may be impossible. Failing this method, we must rely on vaginal examinations; although, before the membranes are ruptured, and when the presenting part is high in the pelvis, it is not always easy to gain accurate information in this way. The difficulty is increased by the paramount importance of retaining the membranes intact as long as possible. It should be remembered, therefore, that when a presentation of the superior extremity is suspected, the necessary examinations should only be made in the intervals between the pains when the membranes are lax, and never when they are rendered tense by the uterine contractions.

As either the shoulder, the elbow, or the hand, may present, it will be best to describe the peculiarities of each separately, and the means of distinguishing to which side of the body the presenting part belongs.

1. The *shoulder* is recognized as a round, smooth prominence, at one point of which may often be felt the sharp edge of the acromion. If the finger can be passed sufficiently high, it may be possible to feel the clavicle and the spine of the scapula. A still more complete examination may enable us to detect the ribs and the intercostal spaces, which would be quite conclusive as to the nature of the presentation, since there is nothing resembling them in any other part of the body. At the side of the shoulder the hollow of the axilla may generally be made out.

Mode of Diagnosing the Position of the Child.—In order to as-

* Annal. d'hyg. pub. et de med., Jan., 1879.

certain the position of the child we have to find out in which iliac fossa the head lies. This may be done in two ways: 1st. The head may be felt through the abdominal parietes by palpation; and 2d, since the axilla always points towards the feet, if it point to the left side the head must lie in the right iliac fossa; if to the right, the head must be placed in the left iliac fossa. Again, the spine of the scapula must correspond to the back of the child, the clavicle to its abdomen; and, by feeling one or other, we know whether we have to do with a dorso-anterior or dorso-posterior position. If we cannot satisfactorily determine the position by these means, it is quite legitimate practice to bring down the arm carefully, provided the membranes are ruptured, so as to examine the hand, which will be easily recognized as right or left. This expedient will decide the point; but it is one which it is better to avoid, if possible, for it not only slightly increases the difficulty of turning, although perhaps not very materially, but the arm might possibly be injured in the endeavor to bring it down.

Differential Diagnosis of the Shoulder.—The only part of the body likely to be taken for the shoulder is the breech; but in that its larger size, the groove in which the genital organs lie, the second prominence formed by the other buttock, and the sacral spinous processes are sufficient to prevent a mistake.

2. The *elbow* is rarely felt at the os, and may be readily recognized by the sharp prominence of the olecranon, situated between two lesser prominences, the condyles. As the elbow always points towards the feet, the position of the fœtus can be easily ascertained.

3. The *hand* is easy to recognize, and can only be confounded with the foot. It can be distinguished by its borders being of the same thickness, by the fingers being wider apart and more readily separated from each other than the toes, and, above all, by the mobility of the thumb, which can be carried across the palm, and placed in apposition with each of the fingers.

Mode of Detecting which Hand is Presenting.—It is not difficult to tell which hand is presenting. If the hand be in the vagina, or beyond the vulva, and within easy reach, we recognize which it is by laying hold of it as if we were about to shake hands. If the palm lie in the palm of the practitioner's hand, with the two thumbs in apposition, it is the right hand; if the back of the hand, it is the left. Another simple way is, for the practitioner to imagine his own hand placed in precisely the same position as that of the fœtus; and this will readily enable him to verify the previous diagnosis. A simple rule tells us how the body of the child is placed, for, provided we are sure the hand is in a state of supination, the back of the hand points to the back of the child, the palm to its abdomen, the thumb to the head, and the little finger to the feet.

Mechanism.—It is perhaps hardly proper to talk of a mechanism of shoulder presentations, since, if left unassisted, they almost invariably lead to the gravest consequences. Still, nature is not entirely at fault even here, and it is well to study the means she adopts to terminate these malpositions.

Terminations.—There are two possible terminations of shoulder presentation. In one, known as "*spontaneous version*," some other part of the fœtus is substituted for that originally presenting; in the other, "*spontaneous evolution*," the fœtus is expelled by being squeezed through the pelvis, without the originally presenting part being withdrawn. It cannot be too strongly impressed on the mind that neither of these can be relied on in practice.

Spontaneous version may occasionally occur before, or immediately after, the rupture of the membranes, when the fœtus is still readily movable within the cavity of the uterus. A few authenticated cases are recorded in which the same fortunate issue took place after the shoulder had been engaged in the pelvic brim for a considerable time, or even after prolapse of the arm; but its probability is necessarily much lessened under such circumstances. Either the head or the breech may be brought down to the os in place of the original presentation.

The precise mechanism of spontaneous version, or the favoring circumstances, are not sufficiently understood to justify any positive statement with regard to it.

Cazeaux believed that it is produced by partial or irregular contraction of the uterus, one side contracting energetically, while the other remains inert, or only contracts to a slight degree. To illustrate how this may effect spontaneous version, let us suppose that the child is lying with the head in the left iliac fossa. Then if the left side of the uterus should contract more forcibly than the right, it would clearly tend to push the head and shoulder to the right side, until the head came to present instead of the shoulder. A very interesting case is related by Geneuil,* in which he was present during spontaneous version, in the course of which the breech was substituted for the left shoulder more than four hours after the rupture of the membranes. In this case the uterus was so tightly contracted that version was impossible. He observed the side of the uterus opposite the head contracting energetically, the other remaining flaccid, and eventually the case ended without assistance, the breech presenting. The natural moulding action of the uterus, and the greater tendency of the long axis of the child to lie in that of the uterus, no doubt assist the transformation, and much must depend on the mobility of the fœtus in any individual case.

That such changes often take place in the latter weeks of pregnancy, and before labor has actually commenced, is quite certain, and they are probably much more frequent than is generally supposed. When spontaneous version does occur, it is, of course, a most favorable event; and the termination and prognosis of the labor are then the same as if the head or breech had originally presented.

Spontaneous Evolution.—The mechanism of spontaneous evolution, since it was first clearly worked out by Douglas, has been so often and carefully described that we know precisely how it occurs. Although every now and then a case is recorded in which a living child has been born by this means, such an event is of extreme rarity; and there is no doubt of the accuracy of the general opinion, that spontaneous evolution can only happen when the pelvis is unusually roomy and the child small; and that it almost necessarily involves the death of the fœtus, on account of the immense pressure to which it is subjected.

Two varieties are described, in one of which the head is first born, in the other the breech; in both the originally presenting arm remained prolapsed. The former is of extreme rarity, and is believed only to have happened with very premature children, whose bodies were small and flexible, and when traction had been made on the presenting arm. Under such circumstances it can hardly be called a natural process, and we may confine our attention to the latter and more common variety.

What takes place is as follows: The presenting arm and shoulder are tightly jammed down, as far as is possible, by the uterine contractions, and the head becomes strongly flexed on the shoulder. As much of the body of the fœtus as the pelvis will contain becomes engaged, and then a movement of rotation occurs, which brings the body of the child nearly into the antero-posterior diameter of the pelvis. The shoulder projects under the arch of the pubis, the head lying above the symphysis, and the breech near the sacro-iliac synchondrosis. It is essential that the head should lie forwards above the pubes, so that the length of the neck may permit the shoulder to project under the pubic arch, without any part of the head entering the pelvic cavity. The shoulder and neck of the child now become fixed points, round which the body of the child rotates, and the whole force of the uterine contractions is expended on the breech. The latter, with the body, therefore, becomes more and more depressed, until, at last, the side of the thorax reaches the vulva, and, followed by the breech and inferior extremities, is slowly pushed out. As soon as the limbs are born the head is easily expelled.

The enormous pressure to which the body is subjected in this process can readily be understood. As regards the practical bearings of this termination of shoulder presentations, all that need be

* Ann. de Gynécologie, v. v. 1876.

said is, that, if we should happen to meet with a case in which the shoulder and thorax were so strongly depressed that turning was impossible, and in which it seemed that nature was endeavoring to effect evolution, we would be justified in aiding the descent of the breech by traction on the groin, before resorting to the difficult and hazardous operation of embryotomy or decapitation.

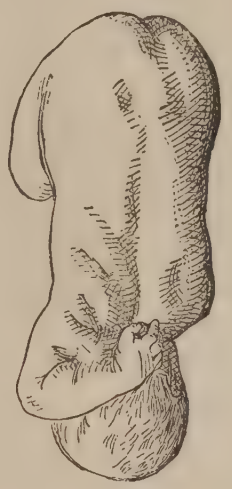
Treatment.—It is unnecessary to describe specially the treatment of shoulder presentation, since it consists essentially in performing the operation of turning, which is fully described elsewhere. It is only needful here to insist on the advisability of performing the operation in the way which involves the least interference with the uterus. Hence if the nature of the case be detected before the membranes are ruptured, an endeavor should be made—and ought generally to succeed—to turn by external manipulation only. If we can succeed in bringing the breech or head over the os in this way, the case will be little more troublesome than an ordinary presentation of these parts. Failing in this, turning by combined external and internal manipulation should be attempted; and the introduction of the entire hand should be reserved for those more troublesome cases in which the waters have long drained away, and in which both these methods are inapplicable.

Should all these means fail, we must resort to the mutilation of the child by embryulcia or decapitation, probably the most difficult and dangerous of all obstetric operations.

Complex Presentations.—There are various so-called *complex presentations* in which more than one part of the fœtal body presents. Thus we may have a hand or a foot presenting with the head, or a foot and hand presenting simultaneously. The former do not necessarily give rise to any serious difficulty, for there is generally sufficient room for the head to pass. Indeed it is unlikely that either the hand or foot should enter the pelvic brim with the head, unless the head was unusually small, or the pelvis more than ordinarily capacious. As regards treatment, it is, no doubt, advisable to make an attempt to replace the hand or foot by pushing it gently above the head in the intervals between the pains, and maintaining it there until the head be fully engaged in the pelvic cavity. The engagement of the head can be hastened by abdominal pressure, which will prove of great value. Failing this, all we can do is to place the presenting member at the part of the pelvis where it will least impede the labor, and be the least subjected to pressure; and that will generally be opposite the temple of the child. As it must obstruct the passage of the head to a certain extent, the application of the forceps may be necessary. When the feet and hands present at the same time, in addition to the confusing nature of the presentation from so many parts being felt together, there is the risk of the hands coming down, and converting the case into one of arm presentation. It is the obvious duty of the accoucheur to prevent this by insuring the descent of the feet, and traction should be made on them, either with the fingers or with a lac, until their descent, and the ascent of the hands, are assured.

Dorsal Displacement of the Arm.—In connection with this subject may be mentioned the curious dorsal displacement of the arm first described by Sir James Simpson, in which the forearm of the child becomes thrown across and behind the neck. The result is the formation of a ridge or bar, which prevents the descent of the head into the pelvis by hitching against the brim (Fig. 77). The difficulty of diagnosis is very great, for the cause of obstruction is too high up to be felt. But if we meet with a case in which the pelvis is roomy and the pains strong, and yet the head does not descend after an adequate time, a full exploration of the cause is essential. For this purpose we would naturally put the patient under chloroform, and pass the hand sufficiently high. We might then feel the arm in its abnormal position. That was what took place in a case under my own care, in which I failed to get the head through the brim with the forceps, and eventually delivered by turning. The same course was adopted by my friend Mr. Jardin Murray in a similar case.* Simpson advises that the arm should be brought down so as to convert the case into an ordinary hand and head presentation. This, if the arm be above the brim, must always be difficult, and I believed the simpler and more effective plan is pedalic version. A similar displacement may cause some difficulty in breech presentations, and after turning (Fig. 78). Delay here is easier of diagnosis, since the obstacle to

Fig. 77.



Dorsal Displacement of the Arms.

Fig. 78.

Dorsal Displacement of the Arms in Footling Presentations. (After Barnes.)

the expulsion will at once lead to careful examination. By carrying the body of the child well backwards, so as to enable the finger to pass behind the symphysis pubis and over the shoulder, it will generally be easy to liberate the arm.

Prolapse of the Umbilical Cord.—It occasionally happens that the umbilical cord falls down past the presenting part (Fig. 79),

Fig. 79.

Prolapse of the Umbilical Cord.

and is apt to be pressed between it and the walls of the pelvis. The consequence is, that the fœtal circulation is seriously interfered with, and the death of the child from asphyxia is a common result. Hence prolapse of the funis is a very serious complication of labor in so far as the child is concerned.

Frequency.—Fortunately it is not a very frequent occurrence. Churchill calculates that out of over 105,000 deliveries it was met with once in 240 cases, and Scanzoni once in 254. Its frequency varies much under different circumstances, and in different places. We find from Churchill's figures a remarkable difference in the proportional number of cases observed in France, England, and

* Med. Times and Gaz., 1861.

Germany, viz., 1 in 446½, 1 in 207½, and 1 in 156, respectively. Great as is the proportion referred to Germany in these figures, it has been found to be exceeded in special districts. Thus Engelman records 1 case out of 94 labors in the Lying-in Hospital at Berlin, and Michaelis 1 in 90 in that of Kiel. These remarkable differences are at first sight not easy to account for. Dr. Simpson suggests, with considerable show of probability, that the difference in frequency in England, France, and Germany, may depend on the varying positions in which lying-in women are placed during labor in each country. In France, where, although the patient is laid on her back, the pelvis is kept elevated, the complication occurs least frequently; in England, where she lies on her side, more often; and in Germany, where she is placed on her back, with her shoulders raised, most often. The special frequency of prolapsed funis in certain districts, as in Kiel, is supposed by Engelman* to depend on the prevalence of rickets, and consequently of deformed pelvis, which we shall presently see is probably one of the most frequent and important causes of the accident.

Prognosis.—With regard to the danger attending prolapsed funis, as far as the mother is concerned, it may be said to be altogether unimportant; but the universal experience of obstetricians points to the great risk to which the child is subjected. Scanzoni calculates that 45 per cent. only of the children were saved; Churchill estimated the number at 47 per cent.; thus, under the most favorable circumstances, this complication leads to the death of more than half the children. Engelman found that out of 202 vertex presentations only 36 per cent. of the children survived. The mortality was not nearly so great in other presentations; 68 per cent. of the cases in which the child presented with the feet were saved, and 50 per cent. in original shoulder presentations. The reason of this remarbable difference is, doubtless, that in vertex presentations the head fits the pelvis much more completely, and subjects the cord to much greater pressure; while in other presentations the pelvis is less completely filled, and the interference with the circulation in the cord is not so great. Besides, in the latter case, the complication is detected early, and the necessary treatment sooner adopted.

The fœtal mortality is considerably greater in first labors; a result to be expected on account of the greater resistance of the soft parts, and the consequent prolongation of the labor.

Causes.—The causes of prolapse of the funis are any circumstances which prevent the presenting part accurately fitting the pelvic brim. Hence it is much more frequent in face, breech, or shoulder, than in vertex presentations, and is relatively more common in footling and shoulder presentations than in any other. Amongst occasional accidental predisposing causes may be mentioned early rupture of the membranes, especially if the amount of liquor amnii be excessive, as the sudden escape of the fluid washes down the cord; undue length of the cord itself; or an unusually low placental attachment. Engelman attaches great importance to slight contraction of the pelvis, and states that in the Berlin Lying-in Hospital, where accurate measurements of the pelvis were taken in all cases, it was almost invariably found to exist. The explanation is evident, since one of the first results of pelvic contraction is to prevent the ready engagement of the presenting part in the pelvic brim.

Diagnosis.—The diagnosis of cord presentation is generally devoid of difficulty; but if the membranes are still unruptured, it may not always be quite easy to determine the precise nature of the soft structures felt through them, as they recede from the touch. If the pulsations of the cord can be felt through the membranes, all difficulty is removed. After the membranes are ruptured, there is nothing that it can well be mistaken for.

Importance of Determining the Pulsations of the Cord.—The important point to determine in such a case is whether the cord be pulsating or not; for if pulsations have entirely ceased, the inference is that the child is dead, and the case may then be left to nature without further interference. It is of importance, however, to be careful; for, if the examination be made during a pain, the circulation might be only temporarily arrested. The examination, therefore, should be made during an interval, and a loop of the cord pulled down, if necessary, to make ourselves absolutely certain on this point.

Amount of Cord Prolapsed.—The amount of the prolapse varies much. Sometimes only a knuckle of the cord, so small as to escape observation, is engaged between the pelvis and presenting part. Under such circumstances the child may be sacrificed without any suspicion of danger having arisen. More often the amount prolapsed is considerable; sometimes so as to lie in the vagina in a long loop, or even to protrude altogether beyond the vulva.

Treatment.—In the treatment the great indication is to prevent the cord from being unduly pressed on, and all our endeavors must have this object in view. If the presentation be detected before the full dilatation of the cervix, and when the membranes are unruptured, we must try to keep the cord out of the way; to preserve the membranes intact as long as possible, since the cord is tolerably protected as long as it is surrounded by the liquor amnii; and to secure the complete dilatation of the os, so that the presenting part may engage rapidly and completely.

Postural Treatment.—Much may be done at this time by the postural treatment, which we chiefly owe to the ingenuity of Dr. T. Gaillard Thomas, of New York, whose writings familiarized the profession with it, although it appears that a somewhat similar plan had been occasionally adopted previously. Dr. Thomas' method is based on the principle of causing the cord to slip back into the uterine cavity by its own weight. For this purpose the patient is placed on her hands and knees, with the hips elevated, and the shoulders resting on a lower level (Fig. 80). The cervix is then no longer the most dependent portion of the uterus, and the anterior wall of the uterus forms an inclined plane down which the cord slips. The success of this manœuvre is sometimes very great, but by no means always so. It is most likely to succeed when the membranes are unruptured. If, when adopted, the cord slips away, and the os be sufficiently dilated, the membranes may be ruptured, and engagement of the head produced by properly applied uterine pressure. Sometimes the position is so irksome that it is impossible to resort to it. Postural treatment is not even then altogether impossible, for by placing the patient on the side opposite to that of the prolapse, so as to relieve the cord as much as possible from pressure, and at the same time elevating the hips by a pillow, it may slip back. Even after the membranes are ruptured, postural treatment in one form or another may succeed; and, as it is simple and harmless, it should certainly be always tried. Attempts at reposition, by one or other of the methods described below, may also occasionally be facilitated by trying them when the patient is placed in the knee-shoulder position.

Fig. 80.

Postural Treatment of Prolapse of the Cord.

Artificial Reposition.—Failing by postural treatment, or in combination with it, it is quite legitimate to make an attempt to place the cord beyond the reach of dangerous pressure by other methods.

* Amer. Journ. of Obst., vol. vi.

Unfortunately reposition is too often disappointing, difficult to effect, and very frequently, even when apparently successful, shortly followed by a fresh descent of the cord. Provided the os be fully dilated, and the presenting head engaged in the pelvis (for reposition may be said to be hopeless when any other part presents), perhaps the best way is to attempt it by the hand alone. Probably the simplest and most effectual method is that recommended by McClintock and Hardy, who advise that the patient should lie on the opposite side to the prolapsed cord, which should then be drawn towards the pubis as being the shallowest part of the pelvis. Two or three fingers may then be used to push the cord past the head, and as high as they can reach. They must be kept in the pelvis until a pain comes on, and then very gently withdrawn, in the hope that the cord may not again prolapse. During the pain external pressure may very properly be applied to favor descent of the head. This manœuvre may be repeated during several successive pains, and may eventually succeed. The attempt to hook the cord over the fœtal limbs, or to place it in the hollow of the neck, recommended in many works, involves so deep an introduction of the hand that it is obviously impracticable.

Instruments Used for Reposition.—Various complex instruments have been invented to aid reposition (Fig. 81), but even if we possessed them they are not likely to be at hand when the emergency arises. A simple instrument may be improvised out of an ordinary male elastic catheter, by passing the two ends of a piece of string through it, so as to leave a loop emerging from the eye of the catheter. This is passed through the loop of prolapsed cord, and then fixed in the eye of the catheter by means of the stilette. The cord is then pushed up into the uterine cavity by the catheter, and liberated by withdrawing the stilette. Another simple instrument may be made by cutting a hole in a piece of whalebone. A piece of tape is then passed through the loop of the cord, and the ends threaded through the eye cut in the whalebone. By tightening the tape the whalebone is held in close apposition to the cord, and the whole is passed as high as possible into the uterine cavity. The tape can easily be liberated by pulling one end. If preferred, the cord can be tied to the whalebone, which is left in utero until the child is born. Nothing need be said as to the various other methods adopted for keeping up the cord, such as the insertion of pieces of sponge, or tying the cord in a bag of soft leather, since they are generally admitted to be quite useless.

Fig. 81.

Braun's Apparatus for Replacing the Cord.

Treatment when Reposition Fails.—It only too often happens that all endeavors at reposition fail. The subsequent treatment must then be guided by the circumstances of the case. If the pelvis be roomy, and the pains strong, especially in a multipara, we may often deem it advisable to leave the case to nature, in the hope that the head may be pushed through before pressure on the cord has had time to prove fatal to the child. Under such circumstances the patient should be urged to bear down, and the descent of the head promoted by uterine pressure, so as to get the second stage completed as soon as possible. If the head be within easy reach, the application of the forceps is quite justifiable, since delay must necessarily involve the death of the child. During this time the cord should be placed, if possible, opposite one or other sacro-iliac synchondrosis, according to the position of the head, as the part of the pelvis where there is most room, and where the pressure would consequently be least prejudicial. If we have to do with a case in which the head has not descended into the pelvis, and postural treatment and reposition have both failed, provided the os be fully dilated, and other circumstances be favorable, turning would undoubtedly offer the best chance to the child. This treatment is strongly advocated by Engelman, who found that 70 per cent. of the children delivered in this way were saved. There can be no question that, so far as the interests of the child are concerned, it is, under the circumstances indicated, by far the best expedient. Turning, however, is by no means always devoid of a certain risk to the mother, and the performance of the operation, in any particular case, must be left to the judgment of the practitioner. A fully dilated os, with membranes unruptured, so that version could be performed by the combined method without the introduction of the hand into the uterus, would be unquestionably the most favorable state. If it be not deemed proper to resort to it, all that can be done is to endeavor to save the cord from pressure as much as possible, by one or other of the methods already mentioned.

SECTION IX.

PROLONGED AND PRECIPITATE LABORS.

Among the difficulties connected with parturition there are none of more frequent occurrence, and none requiring more thorough knowledge of the physiology and pathology of labor, than those arising from deficient or irregular action of the expulsive powers. The importance of studying this class of labors will be seen when we consider the numerous and very diverse causes which produce them.

Evil Effects of Prolonged Labor.—That the mere prolongation of labor is in itself a serious thing, is becoming daily more and more an acknowledged axiom of midwifery practice ; and that this is so is evident when we contrast the statistical returns of such institutions as the Rotunda Lying-in Hospital of late years with those which were published some twenty or thirty years ago. It may be fairly assumed that the practice of the distinguished heads of that well-known school represents the most advanced and scientific opinion of the day. When we find that, less than thirty years ago, the forceps were not used more than once in 310 labors, while according to the report for 1873 the late Master applied them once in 8 labors, it is apparent how great is the change which has taken place.

Causes of Prolonged Labor.—Labor may be prolonged from an immense number of causes, the principal of which will require separate study. Some depend simply on defective or irregular action of the uterus ; others act by opposing the expulsion of the child, as, for example, undue rigidity of the parturient passages, tumors, bony deformity, and the like. Whatever the source of delay, a train of formidable symptoms are developed, which are fraught with peril both to the mother and the child. As regards the mother, they vary much in degree, and in the rapidity with which they become established. In many cases, in which the action of the uterus is slight, it may be long before serious results follow ; while in others, in which a strongly-acting organ is exhausting itself in futile endeavors to overcome an obstacle, the worst signs of protraction may come on with comparative rapidity.

The Influence of the Stage of Labor in Protraction.—The stage of labor in which delay occurs has a marked effect in the production of untoward symptoms. It is a well-established fact that prolongation is of comparatively small consequence to either the mother or child in the first stage, when the membranes are still intact, and when the soft parts of the mother, as well as the body of the child, are protected by the liquor amnii from injurious pressure ; whereas if the membranes have ruptured, prolongation becomes of the utmost importance to both as soon as the head has entered the pelvis, when the uterus is strongly excited by reflex stimulation, when the maternal soft parts are exposed to continuous pressure, and when the tightly-contracted uterus presses firmly on the fœtus and obstructs the placental circulation. It is in reference to the latter class of cases that the change of practice, already alluded to, has taken place, with the most beneficial results both to the mother and child.

It must not be assumed, however, that prolongation of labor is never of any consequence until the second stage has commenced. The fallacy of such an opinion was long ago shown by Simpson,

who proved, in the most conclusive way, that both the maternal and fœtal mortality were greatly increased in proportion to the entire length of the labor; and all practical accoucheurs are familiar with cases in which symptoms of gravity have arisen before the first stage is concluded. Still, relatively speaking, the opinion indicated is undoubtedly correct.

In the present section we have only to do with those causes of delay connected with the expulsive powers. Inasmuch, however, as the injurious effects of protraction are similar in kind, whatever be the cause, it will save needless repetition if we consider, once for all, the train of symptoms that arise whenever labor is unduly prolonged.

Delay in the First Stage.—As long as the delay is in the first stage only, with rare exceptions, no symptoms of real gravity arise for a length of time; it may be even for days. There is often, however, a partial cessation of the pains, which in consequence of temporary exhaustion of nervous force, may even entirely disappear for many consecutive hours. Under such circumstances, after a period of rest, either natural or produced by suitable sedatives, they recur with renewed vigor.

Symptoms of Protraction in the Second Stage.—A similar temporary cessation of the pains may often be observed after the head has passed through the os uteri, to be also followed by renewed vigorous action after rest. But now any such irregularity must be much more anxiously watched. In the majority of cases any marked alteration in the force and frequency of the pains at this period indicates a much more serious form of delay, which in no long time is accompanied by grave general symptoms. The pulse begins to rise, the skin to become hot and dry, the patient to be restless and irritable. The longer the delay, and the more violent the efforts of the uterus to overcome the obstacle, the more serious does the state of the patient become; the tongue is loaded with fur, and in the worst cases, dry and black; nausea and vomiting often become marked; the vagina feels hot and dry, the ordinary abundant mucuous secretion being absent; in severe cases it may be much swollen, and if the presenting part be firmly impacted, a slough may even form. Should the patient still remain undelivered, all these symptoms become greatly intensified; the vomiting is incessant, the pulse is rapid and almost imperceptible, low muttering delirium supervenes, and the patient eventually dies with all the worst indications of profound irritation and exhaustion.

So formidable a train of symptoms, or even the slighter degrees of them, should never occur in the practice of the skilled obstetrician; and it is precisely because a more scientific knowledge of the process of parturition has taught the lesson that, under such circumstances, prevention is better than cure, that earlier interference has become so much more the rule.

Those who taught that nothing should be done until nature had had every possible chance of effecting delivery, and who, therefore, allowed their patients to drag on in many weary hours of labor, at the expense of great exhaustion to themselves, and imminent risk to their offspring, made much capital out of the time-honored maxim that "meddlesome midwifery is bad." When this proverb is applied to restrain the rash interference of the ignorant, it is of undeniable value; but, when it is quoted to prevent the scientific action of the experienced, who know precisely when and why to interfere, and who have acquired the indispensable mechanical skill, it is sadly misapplied.

State of the Uterus in Protracted Labor.—The nature of the pains and the state of the uterus, in cases of protracted labor, are peculiarly worthy of study, and have been very clearly pointed out by Dr. Braxton Hicks.* He shows that, when the pains have apparently fallen off and become few and feeble, or have entirely ceased, the uterus is in a state of continuous or tonic contraction, and that the irritation resulting from this is the chief cause of the more marked symptoms of powerless labor. If, in a case of the kind, the uterus be examined by palpation, it will be found firmly contracted between the pains. The correctness of this observation is beyond question, and it will, no doubt, often be an important guide in treatment. Under such circumstances instrumental interference is imperatively demanded.

Conditions and Causes Affecting the Expulsive Powers.—In considering the causes of protracted labor, it will be well first to discuss those which affect the expulsive powers alone, leaving those depending on morbid states of the passages for future consideration; bearing in mind, however, that the results, as regards both the mother and the child, are identical, whatever may be the cause of delay.

Constitution of the Patient.—The general constitutional state of the patient may materially influence the force and efficiency of the pains. Thus it not unfrequently happens that they are feeble and ineffective in women of very weak constitution, or who are much exhausted by debilitating disease. Cazeaux pointed out that the effects of such general conditions are often more than counterbalanced by flaccidity and want of resistance of the tissues, so that there is less obstacle to the passage of the child. Thus in phthisical patients reduced to the last stage of exhaustion, the labor is not unfrequently surprisingly easy.

Influence of Tropical Climates.—Long residence in tropical climates causes uterine inertia, in consequence of the enfeebled nervous power it produces. It is a common observation that European residents in India are peculiarly apt to suffer from past-partum hemorrhage from this cause. The general mode of life of patients has an unquestionable effect; and it is certain that deficient and irregular uterine action is more common in women of the higher ranks of society, who lead luxurious, enervating lives, than in women whose habits are of a more healthy character.

Frequent Child-bearing.—Tyler Smith lays much stress on frequent child-bearing as a cause of inertia, pointing out that a uterus which has been very frequently subjected to the changes connected with pregnancy is unlikely to be in a typically normal condition. It is doubtful, however, whether the uterus of a perfectly healthy woman is affected in this way; certainly, if child-bearing had undermined her general health, the labors are likely to be modified also.

Age of Patient.—Age has a decided effect. In the very young the pains are apt to be irregular, on account of imperfect development of the uterine muscle. Labor taking place for the first time in women advanced in life is also apt to be tedious, but not by any means so invariably as is generally believed. The apprehensions of such patients are often agreeably falsified, and where delay does occur, it is probably more often referable to rigidity and toughness of the parturient passages than to feebleness of the pains.

Disorders of the Intestines.—Morbid states of the primæ viæ frequently cause irregular, painful, and feeble contractions. A loaded state of the rectum has often a remarkable influence, as evidenced by the sudden and distinct change in the character of the labor which often follows the use of suitable remedies. Undue distension of the bladder often acts in the same way, more especially in the second stage. When the urine has been allowed to accumulate unduly, the contraction of the accessory muscles of parturition often causes such intense suffering, by compressing the distended viscus, that the patient is absolutely unable to bear down. Hence the labor is carried on by uterine contractions alone, slowly, and at the expense of much suffering. A similar interference with the action of the accessory muscles is often produced by other causes. Thus if labor comes on when the patient is suffering from bronchitis or other chest disease, she may be quite unable to fix the chest by a deep inspiration, and the diaphragm and other accessory muscles cannot act. In the same way they may be prevented from acting when the abdomen is occupied by an ovarian tumor, or by ascitic fluid.

Mental conditions have a very marked effect. This is so commonly observed that it is familiar to the merest beginner in

*Obst. Trans., vol. ix.

midwifery practice. The fact that the pains often diminish temporarily on the entrance of the accoucheur is known to every nurse; and so also undue excitement, the presence of too many people in the room, over-much talking, have often the same prejudicial effect. Depression of mind, as in unmarried women, and fear and despondency in women who have looked forward with apprehension to their labor, are also common causes of irregular and defective action.

Excessive Amount of Liquor Amnii.—Undue distension of the uterus from an excessive amount of liquor amnii not unfrequently retards the first stage, by preventing the uterus from contracting efficiently. When this exists, the pains are feeble and have little effect in dilating the cervix beyond a certain degree. This cause may be suspected, when undue protraction of the first stage is associated with an unusually large size and marked fluctuation of the uterine tumor, through which the fœtal limbs cannot be made out on palpation. On vaginal examination, the lower segment of the uterus will be found to be very rounded and prominent, while the bag of membranes will not bulge through the os during the acme of the pain.

Malpositions of the Uterus.—A somewhat similar cause is undue obliquity of the uterus, which prevents the pains acting to the best mechanical advantage, and often retards the entry of the presenting part into the brim. The most common variety is anteversion, resulting from excessive laxity of the abdominal parietes, which is especially found in women who have borne many children. Sometimes this is so excessive that the fundus lies over the pubis, and even projects downwards towards the patient's knees. The consequence is that, when labor sets in, unless corrective means be taken, the pains force the head against the sacrum, instead of directing it into the axis of the pelvic inlet. Another common deviation is lateral obliquity, a certain degree of which exists in almost all cases, but sometimes it occurs to an excessive degree. Either of these states can readily be detected by palpation and vaginal examination combined. In the former the os may be so high up, and tilted so far backwards, that it may be at first difficult to reach it at all.

Irregular and Spasmodic Pains.—Besides being feeble, the uterine contractions, especially in the first stage, are often irregular and spasmodic, intensely painful, but producing little or no effect on the progress of the labor. This kind of case has been already alluded to in treating of the use of anæsthetics, and is very common in highly nervous and emotional women of the upper classes. Such irregular contractions do not necessarily depend on mental causes alone, and they are often produced by conditions producing irritation, such as loaded bowels, too early rupture of the membranes, and the like. Dr. Trenholme, of Montreal,* believes that such irregular pains most frequently depend on abnormal adhesions between the decidua and the uterine walls, which interfere with the proper dilatation of the os, and he has related some interesting cases in support of this theory.

Treatment.—The mere enumeration of these various causes of protracted labor will indicate the treatment required. Some of them, such as the constitutional state of the patient, age, or mental emotion, it is, of course, beyond the power of the practitioner to influence or modify; but in every case of feeble or irregular uterine action, a careful investigation should be made with the view of seeing if any removable cause exist. For example, the effect of a large enema, when we suspect the existence of a loaded rectum, is often very remarkable; the pains frequently almost immediately changing in character, and a previously lingering labor being rapidly terminated.

Excessive distension of the uterus can only be treated by artificial evacuation of the liquor amnii; and after this is done, the character of the pains often rapidly changes. This expedient is indeed often of considerable value in cases in which the cervix has dilated to a certain extent, but in which no further progress is made, especially if the bag of membranes does not protrude through the os during the pains, and the cervix itself is soft, and apparently readily dilatable. Under such circumstances, rupture of the membranes, even before the os is fully dilated, is often very useful.

Adherent Membranes.—If we have reason to suspect morbid adhesions between the membranes and the uterine walls, an endeavor must be made to separate them by sweeping the finger or a flexible catheter round the internal margin of the os, or puncturing the sac. The former expedient has been advocated by Dr. Inglis,* as a means of increasing the pains when the first stage is very tedious, and I have often practised it with marked success. Trenholme's observation affords a rationale of its action. The manœuvre itself is easily accomplished, and, provided the os be not very high in the pelvis, does not give any pain or discomfort to the patient.

Uterine Deviations.—Attention should always be paid to remedying any deviations of the uterus from its proper axis. If this be lateral, the proper course to pursue is to make the patient lie on the opposite side to that towards which the organ is pointing. In the more common anterior deviation she should lie on her back, so that the uterus may gravitate towards the spine, and a firm abdominal bandage should be applied. This prevents the organ from falling forwards, while its pressure stimulates the muscular fibres to increased action; hence it is often very serviceable when the pains are feeble, even if there be no anteversion.

Temporary Exhaustion.—In a frequent class of cases, especially in the first stage, the pains diminish in force and frequency from fatigue, and the indication then is to give a temporary rest, after which they recommence with renewed vigor. Hence an opiate, such as 20 minims of Battley's solution, which often acts quickest when given in the form of enema, is frequently of the greatest possible value. If this secure a few hours' sleep, the patient will generally awake much refreshed and invigorated. It is important to distinguish this variety of arrested pain from that dependent on actual exhaustion; and this can be done by attention to the general condition of the patient, and especially by observing that the uterus is soft and flaccid in the intervals between the pains, and that there is none of the tonic contraction indicated by persistent hardness of the uterine parietes. When the pains are irregular, spasmodic, and excessively painful, without producing any real effect, opiates are also of great service: and it is under such circumstances that chloral is especially valuable.

Oxytocic Remedies.—Still a large number of cases will arise in which the absence of all removable causes has been ascertained, and in which the pains are feeble and ineffective. We must now proceed to discuss their management. The fault being the want of sufficient contraction, the first indication is to increase the force of the pains. Here the so-called *oxytocic* remedies come into action; and, although a large number of these have been used from time to time, such as borax, cinnamon, quinine, and galvanism, practically, the only one in which any reliance is now placed is the ergot of rye. This has long been the favorite remedy for deficient uterine action, and it is a powerful stimulant of the uterine fibres. It has, however, very serious disadvantages, and it is very questionable whether the risks to both mother and child do not more than counterbalance any advantages attending its use. The ergot is given in doses of 15 or 20 grains of the freshly powdered drug diffused in warm water, or in the more convenient form of the liquid extract in doses of from 20 to 30 minims; or, still better, in the form of ergotine injected hypodermically, 3 to 4 minims of the hypodermic solution being used for the purpose. In about fifteen minutes after its administration the pains generally increase greatly in force and frequency, and if the head be low in the pelvis, and if the soft parts offer no resistance, the labor may be rapidly terminated.

Objections to its Use.—Were its use always followed by this effect

* Obst. Trans., 1873.

* Sydenham Society's Year-Book, 1869.

there would be little or no objection to its administration. The pains, however, are different from those of natural labor, being strong, persistent, and constant. Its effect, indeed, is to produce that very state of tonic and persistent uterine contraction, which has been already pointed out as one of the chief dangers of protracted labor. Hence if, from any cause, the exhibition of the drug be *not* followed by rapid delivery, a condition is produced which is serious to the mother; and which is extremely perilous to the child, on account of the tonic contraction of the muscular fibres obstructing the utero-placental circulation. Dr. Hardy found that soon the fœtal pulsations fall to 100, and, if delivery be long delayed, they commence to intermit. He also observed that when this occurred the child was always born dead, and found that the number of still-born children after ergot has been exhibited was very large; for out of 30 cases in which he gave it in tedious labor only 10 of the children were born alive. Nor is its use by any means free from danger to the mother; a not inconsiderable number of cases of rupture of the uterus have been attributed to its incautious use. Hence, if it is to be given at all, it is obvious that it must be with strict limitations, and after careful consideration. It is worthy of note that in the Bethesda Hospital, in Dublin, the use of ergot as an oxytocic before delivery has been prohibited by the present trustees.

Limitations to its Use.—The cardinal point to remember is that it is absolutely contraindicated unless the absence of all obstacles to rapid delivery has been ascertained. Hence, it is only allowable when the first stage is over, and the os fully dilated; when the experience of former labors has proved the pelvis to be of ample size; and when the perineum is soft and dilatable. Perhaps, as has been suggested, the administration of small doses of from 5 to 10 minims of the liquid extract every ten minutes, until more energetic action set in, might obviate some of these risks.

Manual Pressure as a Means of Increasing the Uterine Contractions.—If we had no other means of increasing defective uterine contractions at our disposal, and if the choice lay only between the use of ergot and instrumental delivery, there might not be so much objection to a cautious use of the drug in suitable cases. We have, however, a means of increasing the force of the uterine contractions so much more manageable, and so much more resembling the natural process, that I believe it to be destined to entirely supersede the administration of ergot. This is the application of manual pressure to the uterus through the abdomen, an expedient that has of late years been much used in Germany, and has begun to be employed in English practice. I believe, therefore, that ergot should be chiefly used for the purpose of exciting uterine contraction after delivery, when its peculiar property of promoting tonic contraction is so valuable, and that it should rarely, if at all, be employed before the birth of the child.

The systematic use of uterine pressure as an oxytocic was first prominently brought under the notice of the profession by Kristeller, under the name of "Expressio Fœtus," although it has been used in various forms from time immemorial. Albucasis, for example, was clearly acquainted with its use, and referred to it in the following terms: "Cum ergo vides ista signa, tunc oportet, ut comprimatur uterus ejus ut descendat embryo velociter." There are some curious obstetric customs among various nations, which probably arose from a recognition of its value; as, for example, the mode of delivery adopted among the Kalmucks, where the patient sits at the foot of the bed, while a woman seated behind her seizes her round the waist and squeezes the uterus during the pains. Amongst the Japanese, Siamese, North American Indians, and many other nations, pressure, applied in various ways, is habitually used.

Kristeller maintains that it is possible to effect the complete expulsion of the child by properly applied pressure, even when the pains are entirely absent. Strange as this may appear to those who are not familiar with the effects of pressure, I believe that, under exceptional circumstances, when the pelvis is very capacious, and the soft parts offer but slight resistance, it can be done. I have delivered in this way a patient whose friends would not permit me to apply the forceps, when I could not recognize the existence of any uterine contraction at all, the fœtus being literally squeezed out of the uterus. It is not, however, as replacing absent pains, but as a means of intensifying and prolonging the effects of deficient and feeble ones, that pressure finds its best application.

Its effects are often very remarkable, especially in women of slight build, where there is but little adipose tissue in the abdominal walls, and not much resistance in the pelvic tissues. If the finger be placed on the head while pressure is applied to the uterus, a very marked descent can readily be felt, and not infrequently two or three applications will force the head on to the perineum. There are, however, certain conditions when it is inapplicable, and the existence of which should contraindicate its use. Thus if the uterus seem unusually tender on pressure, and, *a fortiori*, if the tonic contraction of exhaustion be present, it is inadmissible. So also if there be any obstruction to rapid delivery, either from narrowing of the pelvis or rigidity of the soft parts, it should not be used. The cases suitable for its application are those in which the head or breech is in the pelvic cavity, and the delay is simply due to a want of sufficiently strong expulsive action.

Mode of Application.—It may be applied in two ways. The better is to place the patient on her back at the edge of the bed, and spread the palms of the hands on either side of the fundus and body of the uterus, and, when a pain commences, to make firm pressure during its continuance downwards and backwards in the direction of the pelvic inlet. As the contraction passes off the pressure is relaxed, and again resumed when a fresh pain begins. In this way each pain is greatly intensified, and its effect on the progress of the fœtus much increased. It is not essential that the patient should lie on her back. A useful, although not so great, amount of pressure can be applied when she is lying in the ordinary obstetric position on her left side, the left hand being spread out over the fundus, leaving the right free to watch the progress of the presenting part per vaginam.

Special Value of Uterine Pressure.—The special value of this method of treating ineffective pains is, that the amount and frequency of the pressure are completely within the control of the practitioner, and are capable of being regulated to a nicety in accordance with the requirements of each particular case. It has the peculiar advantage of closely imitating the natural means of delivery, and of being absolutely without risk to the child: nor is there any reason to think that it is capable of injuring the mother. At least I may safely say that, out of the large number of cases in which I have used it, I have never seen one in which I had the least reason to think that it had proved hurtful. Of course, it is essential not to use undue roughness: firm and even strong pressure may be employed, but that can be done without being rough; and, as its application is always intermittent, there is no time for it to inflict any injury on the uterine tissues.

Pressure is specially valuable when it is desirable to intensify feeble pains. It may be serviceably employed when the pains are altogether absent, to imitate and replace them, provided there be nothing but the absence of a *vis à tergo* to prevent speedy delivery. In such cases an endeavor should be made to imitate the pains as closely as possible, by applying the pressure at intervals of four or five minutes, and entirely relaxing it after it has been applied for a few seconds.

Change of Professional Opinion as to Instrumental Delivery.—When all these means fail we have then left the resource of instrumental aid, and we have now to consider the indications for the use of the forceps under such circumstances. It has been already pointed out that professional opinion on this point has been undergoing a marked change; and that it is now recognized as an axiom by the most experienced teachers that, when we are once convinced that the natural efforts are failing, and are unlikely to effect delivery, except at the cost of long delay, it is far better to interfere soon rather than late, and thus prevent the occurrence of the

serious symptoms accompanying protracted labor. The recent important debate on the use of the forceps at the Obstetrical Society of London remarkably illustrated these statements, for, while there was much difference of opinion as to the advisability of applying the forceps when the head was high in the pelvis, a class of cases not now under consideration, it was very generally admitted that the modern teaching was based on correct scientific grounds. This is, of course, directly opposed to the view so long taught in our standard works, in which instrumental interference was strictly prohibited unless all hope of natural delivery was at end; and in which the commencement at least, if not the complete establishment, of symptoms of exhaustion was considered to be the only justification for the application of forceps in lingering labor.

Views of Dr. Johnston on the Use of the Forceps.—The reasons which have led the late distinguished Master of the Rotunda Hospital to a more frequent use of the forceps are so well expressed in his report for 1872 that I venture to quote them, as the best justification for a practice that many practitioners of the older school will, no doubt, be inclined to condemn as rash and hazardous. He says:* "Our established rule is that so long as nature is able to effect its purpose without prejudice to the constitution of the patient, danger to the soft parts, or the life of the child, we are in duty bound to allow the labor to proceed; but as soon as we find the natural efforts are beginning to fail, and after having tried the milder means for relaxing the parts or stimulating the uterus to increased action, and the desired effects not being produced, we consider we are in duty bound to adopt still prompter measures, and by our timely assistance relieve the sufferer from her distress and her offspring from an imminent death. Why, may I ask, should we permit a fellow-creature to undergo hours of torture when we have the means of relieving her within our reach? Why should she be allowed to waste her strength, and incur the risks consequent upon long pressure of the head on the soft parts, the tendency to inflammation and sloughing, or the danger of rupture, not to speak of the poisonous miasm which emanates from an inflammatory state of the passages, the result of tedious labor, and which is one of the fertile causes of puerperal fever and all its direful effects, attributed by some to the influence of being confined in a large maternity, and not to its proper source, *i. e.*, the labor being allowed to continue till inflammatory symptoms appear? The more we consider the benefits of timely interference, and the good results which follow it, the more are we induced to pursue the system we have adopted, and to inculcate in those we are instructing the advantages to be gained by such practice, both in saving the life of the child as well as securing the greater safety of the mother?" It would be impossible to put the matter in a stronger or clearer light, and I feel confident that these views will be indorsed by all who have adopted the more modern practice.

Effect of Early Interference on the Infantile Mortality.—In the first edition of this work I used the statistics of Dr. Hamilton, of Falkirk, and other modern writers, as proving that a more frequent use of the forceps than has been customary diminished in a remarkable degree the infantile mortality. Dr. Galabin† has recently published an admirable paper on this subject, in which, by a careful criticism of these figures, he has, I think, proved that the conclusions drawn from them are open to doubt, and that the saving of infantile life following more frequent forceps delivery is by no means so great as I had supposed. Dr. Roper, in his remarks in the recent debate in the Obstetrical Society, brought forward some strong arguments in support of the same view. This, however, does not in any way touch the main points at issue referred to in the preceding paragraph.

Possible Dangers Attending the Use of the Forceps.—It is, of course, right that we should consider the opposite point of view, and reflect on the disadvantages which may attend the interference advocated. Here I should point out that I am now talking only of the use of the forceps in simple inertia, when the head is low in the pelvic cavity, and when all that is wanted is a slight *vis à fronte* to supplement the deficient *vis à tergo*. The use of the instrument when the head is arrested high in the pelvis, or in cases of deformity, or before the os uteri is completely expanded, is an entirely different and much more serious matter, and does not enter into the present discussion. The chief question to decide is if there be sufficient risk to the mother to counterbalance that of delay. It will, of course, be conceded by all that the forceps in the hands of a coarse, bungling, and ignorant practitioner, who has not studied the proper mode of operating, may easily inflict serious damage. The possibility of inflicting injury in this way should act as a warning to every obstetrician to make himself thoroughly acquainted with the proper mode of using the instrument, and to acquire the manual skill which practice and the study of the mechanism of delivery will alone give; but it can hardly be used as an argument against its use. If that were admitted, surgical interference of any kind would be tabooed, since there is none that ignorance and incapacity might not render dangerous.

Assuming, therefore, that the practitioner is able to apply the forceps skilfully, is there any inherent danger in its use? I think all who dispassionately consider the question must admit that, in the class of cases alluded to, the operation is so simple that its disadvantages cannot for a moment be weighed against those attending protraction and its consequences. Against this conclusion statistics may possibly be quoted, such as those of Churchill, who estimated that 1 in 20 mothers delivered by forceps in British practice were lost. But the fallacy of such figures is apparent on the slightest consideration; and by no one has this been more conclusively shown than by Drs. Hicks and Phillips in their paper on tables of mortality after obstetric operations, where it is proved in the clearest manner that such results are due not to the treatment, but rather to the fact that the treatment was so long delayed.

Impossibility of Giving Definite Rules for Use of Forceps.—It is quite impossible to lay down any precise rule as to when the forceps should be used in uterine inertia. Each case must be treated on its own merits, and after a careful estimate of the effect of the pains. The rules generally taught were, that the head should be allowed to rest at or near the perineum for a number of hours, and that interference was contraindicated if the slightest progress were being made. It is needless to say that both of these rules are incompatible with the views I have been inculcating, and that any rule based upon the length of time the second stage of labor has lasted must necessarily be misleading. What has to be done, I conceive, is to watch the progress of the case anxiously after the second stage has fairly commenced, and to be guided by an estimate of the advance that is being made and the character of the pains, bearing in mind that the risk to the mother, and still more to the child, increases seriously with each hour that elapses. If we find the progress slow and unsatisfactory, the pains flagging and insufficient, and incapable of being intensified by the means indicated, then, provided the head be low in the pelvis, it is better to assist at once by the forceps, rather than to wait until we are driven to do so by the state of the patient.

Precipitate Labor Less Common than Lingering.—Undue rapidity of labor is certainly more uncommon than its converse, but still it is by no means of unfrequent occurrence. Most obstetric works contain a formidable catalogue of evils that may attend it, such as rupture of the cervix, or even of the uterus itself, from the violence of the uterine action; laceration of the perineum from the presenting part being driven through before dilatation has occurred; fainting from the sudden emptying of the uterus; hemorrhage from the same cause. With regard to the child it is held that the pressure to which it is subjected, and sudden expulsion while the mother is in the erect position, may prove injurious. Without denying that these results may possibly occur now and again, in

* Fourth Clinical Report of the Rotunda Lying-in Hospital for the year ending 1872.

† Obstetrical Journal, December, 1877.

the majority of cases over-rapid labor is not attended with any evil effects.

Precipitate labor may generally be traced to one of two conditions, or to a combination of both; excessive force and rapidity of the pains, or unusual laxity and want of resistance of the soft parts. The precise causes inducing these it is difficult to estimate. In some cases the former may depend on an undue amount of nervous excitability, and the latter on the constitutional state of the patient tending to relaxation of the tissues.

Whatever the cause, the extreme rapidity of labor is occasionally remarkable, and one strong pain may be sufficient to effect the expulsion of the child, with little or no preliminary warning. I have known a child to be expelled into the pan of a water-closet, the only previous indication of commencing labor being a slight griping pain, which led the mother to fancy that an action of the bowels was about to take place. More often there is what may be described as a storm of uterine contractions, one pain following the other with great intensity, until the fœtus is expelled. The natural effect of this is to produce a great amount of alarm or nervous excitement, which of itself forms one of the worst results of this class of labor. It is under such circumstances that temporary mania occurs, produced by the intensity of the suffering, under which the patient may commit acts, her responsibility for which may fairly be open to question.

Treatment.—Little can be done in treating undue rapidity of labor. We can, to some extent, modify the intensity of the pains by urging the patient to refrain from voluntary efforts, and to open the glottis by crying out, so that the chest may no longer be a fixed point for muscular action. Opiates have been advised to control uterine action, but it is needless to point out that, in most cases, there is no time for them to take effect. Chloroform will often be found most valuable, from the rapidity with which it can be exhibited; and its power of diminishing uterine action, which forms one of its chief drawbacks in ordinary practice, will here prove of much service.

SECTION X.

LABOR OBSTRUCTED BY FAULTY CONDITION OF THE SOFT PARTS.

Rigidity of the Cervix a Frequent Cause of Protracted Labor.—One of the most frequent causes of delay in the first stage of labor is the rigidity of the cervix uteri, which may depend on a variety of conditions. It is often produced by premature escape of the liquor amnii, in consequence of which the fluid wedge, which is nature's means of dilating the os, is destroyed and the hard presenting part is consequently brought to bear directly upon the tissues of the cervix, which are thus unduly irritated, and thrown into a state of spasmodic contraction. At other times it may be due to constitutional peculiarities, among which there is none so common as a highly nervous and emotional temperament, which renders the patient peculiarly sensitive to her sufferings, and interferes with the harmonious action of the uterine fibres. The pains, in such cases, cause intense agony, are short and cramp-like in character, but have little or no effect in producing dilatation; the os often remaining for many hours without any appreciable alteration, its edges being thin and tightly stretched over the head. Less often, and this is generally met with in stout, plethoric women, the edges of the os are thick and tough.

Effects.—The effects of prolongation of labor from this cause will vary much under different circumstances. If the liquor amnii be prematurely evacuated, the presenting part presses directly upon the cervix, and the case is then practically the same as if the labor were in the second stage. Hence grave symptoms may soon develop themselves, and early interference may be imperatively demanded. If the membranes be unruptured, delay will be of comparatively little moment, and considerable time may elapse without serious detriment to either the mother or child.

Treatment.—The treatment will naturally vary much with the cause, and the state of the patient. In the majority of cases, especially if the membranes be still intact, patience and time are sufficient to overcome the obstacle; but it is often in the power of the accoucheur materially to aid dilatation by appropriate management. Sometimes nature overcomes the obstruction by lacerating the opposing structures, and cases are on record in which even a complete ring of the cervix has been torn off, and come away before the head.

Many remedies have been recommended for facilitating dilatation, some of which no doubt act beneficially. Among those most frequently resorted to was venesection, and with it was generally associated the administration of nauseating doses of tartar emetic. Both these acted by producing temporary depression, under which the resistance of the soft part was lessened. They probably answered best in cases in which there was a rigid and tough cervix; and they might prove serviceable, even yet, in stout, plethoric women of robust frame. Practically they are now seldom, if ever, employed, and other and less debilitating remedies are preferred. The agent, *par excellence*, which is most serviceable is chloral, which is of special value in the more common cases in which rigidity is associated with spasmodic contraction of the muscular fibres of the cervix. Two to three doses of 15 grains, repeated at intervals of twenty minutes, are often of almost magical efficacy, the pains becoming steady and regular, and the os gradually relaxing sufficiently to allow the passage of the head. Chloroform acts much in the same way, but on the whole less satisfactorily, its effects being often too great; while the peculiar value of chloral is its influence in promoting relaxation of the tissues, without interfering with the strength of the pains.

Local Means of Treatment.—Various local means of treatment may be also advantageously used. One is the warm bath, which is much used in France. It is of unquestionable value where there is much rigidity, and may be used either as an entire bath, or as a hip bath, in which the patient sits from twenty minutes to half an hour. The objection is the fuss and excitement it causes, and, for this reason, it is an expedient seldom resorted to in this country. A similar effect is produced, and much more easily, by a douche of tepid water upon the cervix. This can be very easily administered, the pipe of a Higginson's syringe being guided up to the cervix by the index finger of the right hand, and a stream of water projected against it for five or ten minutes. Smearing the os with extract of belladonna is advised by Continental authorities, but its effects are more than doubtful. Horton* advocates the injection into the tissues of the cervix of $\frac{1}{40}$ of a grain of atropine by means of a hypodermic syringe, and speaks very favorably of the practice.

Artificial dilatation of the cervix by the finger has often been recommended, and has been the subject of much discussion, especially in the Edinburgh school, where it was formerly commonly employed. It is capable of being very useful, but it may also do much injury when roughly and injudiciously used. The class of cases in which it is most serviceable are those in which the liquor amnii has been long evacuated, and in which the head, covered by the tightly stretched cervix, has descended low into the pelvic cavity. Under these circumstances, if the finger be passed gently within the os during a pain, and its margin pressed upwards and over the head as it were, while the contraction lasts, the progress of the case may be materially facilitated. This manœuvre is somewhat similar to that which has been already spoken of, when the anterior lip of the cervix is caught between the head and the pubic bone, and, if properly performed, I believe it to be quite safe, and often of great value. It is not, however, well adapted for those cases in which the membranes are still intact, or in which the os remains undilated when the head is still high in the pelvis. When there is much delay under these conditions, and interference of some kind seems called for, the dilatation may be much assisted by the use of caoutchouc dilators, described in the chapter on the induction of premature labor, which imitate nature's method of opening up the os, and also act as a direct stimulant to uterine

* Amer. Journ. of Obst., July, 1878.

contraction. But it should be remembered, that it is precisely in such cases that delay is least prejudicial. If, however, the os be excessively long in opening, its dilatation may be safely and efficiently promoted by passing within it, and distending with water, one of the smallest-sized bags; and, after this has been in position from ten to twenty minutes, it may be removed, and a larger one substituted.

Rigidity Depending upon Organic Causes.—Every now and again we meet with cases in which the obstacle depends upon organic changes in the cervix, the most common of which are cicatrical hardening from former lacerations; hypertrophic elongation of the cervix from disease antecedent to pregnancy; or even agglutination and closure of the os uteri. Cicatrices are generally the result of lacerations during former labors. They implicate a portion only of the cervix, which they render hard, rigid, and undilatable, while the remainder has its natural softness. They can readily be made out by the examining finger. A somewhat similar, but much more formidable, obstruction is occasionally met with in cases of old-standing hypertrophic elongation of the cervix, which is generally associated with prolapse. In most cases of this kind the cervix becomes softened during pregnancy, so that dilatation occurs without any unusual difficulty. But this does not always happen. A good example is related by Mr. Roper, in the seventh volume of the "Obstetrical Transactions," in which such a cervix formed an almost insuperable obstacle to the passage of the child.

Carcinoma of the cervix uteri, which produces extensive thickening and induration of its tissues, and even advanced malignant disease of the uterus, is no bar to conception. The relations of malignant disease to pregnancy and parturition have recently been well studied by Dr. Herman.* He concludes that cancer renders the patient inapt to conceive, but that when pregnancy does occur there is a tendency to the intra-uterine death and premature expulsion of the fœtus, and the growth of the cancer is accelerated. When delivery is accomplished naturally there is generally expansion of the cervix by fissuring of its tissue, but the harder forms of cancer may form an insuperable obstacle to delivery.

Occlusion of the Os.—Agglutination of the margins of the os uteri is occasionally met with, and must, of course, have occurred after conception. It is generally the result of some inflammatory affection of the cervix during the early months of gestation, and I have known it recur in the same woman in two successive pregnancies. Usually it is not associated with any hardness or rigidity, but the entire cervix is stretched over the presenting part, and forms a smooth covering, in which the os may only exist as a small dimple, and may be very difficult to detect at all. Occlusion of the os uteri from inflammatory change sometimes so alters the cervix that no sign of the original opening can be discovered; and in two such instances the Cæsarean operation has been performed in the United States, by which the women were saved.

Their Treatment.—Any of these mechanical causes of rigidity may at first be treated in the same way as the more simple cases; and with patience, the use of chloral and chloroform, and of the fluid dilators, sufficient expansion to permit the passage of the head will often take place. But if these methods produce no effect, and symptoms of constitutional irritation are beginning to develop themselves, other, and more radical, means of overcoming the obstruction may be required.

Incision of the Cervix.—Under such circumstances incision of the cervix may be not only justifiable but essential, and it frequently answers extremely well. On the Continent it is resorted to much more frequently and earlier than in this country, and with the most beneficial results. The operation offers no difficulties. The simplest way of performing it is to guard the greater portion of the blade of a straight blunt-pointed bistoury by wrapping lint or adhesive plaster round it, leaving about half an inch cutting edge towards its point. This is guided to the cervix, on the under surface of the index finger, and three or four notches are cut in the circumference of the os to about the depth of a quarter of an inch. Very generally, especially when the obstruction is only due to old cicatrices, the pains will now speedily effect complete expansion, which may be very advantageously aided by applying the hydrostatic dilators. When the obstruction is due to carcinomatous infiltration or inflammatory thickening, the case is much more complicated, and will painfully tax the resources of the accoucheur. If it is possible the disease should be removed as much as can be safely done during pregnancy, which should also be brought to an end before the full period. During labor incisions should form a preliminary to any subsequent proceedings that may be necessary, as they are, at the worst, not likely to increase in the least the risks the patient has to run, and they may possibly avert more serious operations. In the case of malignant disease the risk of serious hemorrhage, from the great vascularity of the tissues, must not be forgotten, and, if necessary, means must be taken to check this by local styptics, such as perchloride of iron. If incision fail, and the state of the patient demands speedy delivery, the forceps may be applied, and Herman thinks they are, as a rule, better than turning. He also maintains that there is little difference in the risk to the mothers between craniotomy and the Cæsarean section, and that the possibility of saving the child in cases in which incisions have failed should induce us to prefer the latter.

Application of the Forceps within the Cervix.—Before performing craniotomy, when the os is sufficiently open, a cautious application of the forceps is quite justifiable. Steady and careful downward traction, combined with digital expansion, has often enabled a head to pass with safety through an os that has resisted all other means of dilatation, and the destruction of the child has thus been avoided. If, indeed, the os appear to be dilatable, this procedure may advantageously be adopted before incision, and, as a matter of fact, it is commonly practised in the Rotunda Hospital. An operation involving, beyond doubt, of itself some risk, and requiring considerable operative dexterity, would naturally not be lightly and inconsiderately undertaken. But when it is remembered that the alternative is the destruction of the child, the risk of exhaustion, and at least as great mechanical injury to the mother, its difficulty need not stand in the way of its adoption.

Treatment when Occlusion of the Os Exists.—When the os is apparently obliterated, incision is the only resource. Before resorting to it the patient should be placed under chloroform, and the entire lower segment of the uterus carefully explored. Possibly the aperture may be found high up, and out of reach of an ordinary examination, or we may detect a depression corresponding to its site. A small crucial incision may then be made at the site of the os, if this can be ascertained; if not, at the most prominent portion of the cervix. Very generally the pains will then suffice to complete expansion, which may be further aided by the fluid dilators.

Ante-partum Hour-glass Contraction.—Dr. Hosmer has recently drawn attention to a hitherto undescribed species of dystocia, which he terms "*ante-partum hour-glass contraction*," and which he believes to depend on constriction of the uterine fibres at the site of the internal os uteri. Whatever its site in the cases recorded, difficulties of the most formidable kind come from this cause. The pelves were normal and the presentations natural, yet out of seven labors four ended fatally, two before delivery. The constriction seems to have grasped the fœtus with such force as to have rendered extraction, either by the forceps or turning, impossible. I have no personal experience of this complication, which must fortunately be very rare. The introduction of the hand, the patient being deeply anæsthetized, would probably render diagnosis easy. The treatment must depend on the force and amount of constriction. If the constriction does not relax under chloroform, chloral, or the injection of atropine into the site of constriction, as recommended by Horton in rigidity of the cervix, turning would probably be our best resource. Should this fail, the

* Obstet. Trans., vol. xx., p. 191.

Cæsarean section may be required to effect delivery. Gastro-elytrotomy is obviously unsuitable for such cases.

Bands and Cicatrices in the Vagina.—Extreme rigidity of the vagina, or bands and cicatrices in or across its walls, the result of congenital malformation, of injuries in former labors, or of antecedent disease, occasionally obstruct the second stage. There is seldom any really formidable difficulty from this cause, since the obstruction almost always yields to the pressure of the presenting part. If there be any considerable extent of cicatrices in the vagina, artificial assistance may be required. If we should be aware of their existence during pregnancy, and find them to be sufficiently dense and extensive to be likely to interfere with delivery, an endeavor may be made to dilate them gradually by hydrostatic bags or bougies. If they be not detected until labor is in progress, we must be guided in our procedures by the pressure to which they are subjected. It may then be necessary to divide them with a knife, and to hasten the passage of the head by the forceps, so as to prevent contusion as much as possible. It is obviously impossible to lay down any positive rules for such rare contingencies, the treatment suitable for which must necessarily vary much with the individual peculiarities of the case.

Extreme rigidity of the perineum is often dependent upon cicatricial hardening from injury in previous labors. This may greatly interfere with its dilatation; and if laceration seems inevitable, we may be quite justified in attempting to avert it by incision of the margins of the perineum, on the principle of a clear cut being always preferable to a jagged tear.

Labor Complicated with Tumor.—Occasionally we meet with very formidable obstacles from tumors connected with the maternal structures. These are most commonly either fibroid or ovarian, although others may be met with, such as malignant growths from the pelvic bones, exostoses, etc.

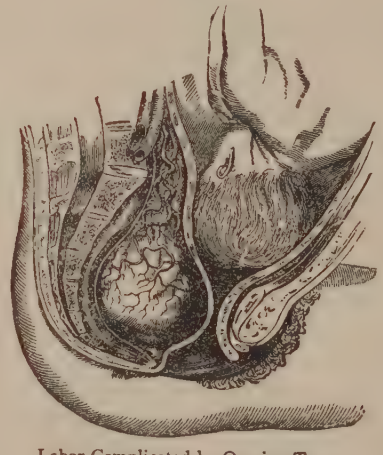
Fibroid Tumors of the Uterus.—Considering the frequency with which women suffer from fibroid tumors of the uterus, it is perhaps somewhat remarkable that they do not more often complicate delivery. Probably women so affected are not apt to conceive. Occasionally, however, cases of this kind cause much anxiety. Of course, the cases are most grave in which the tumors are so situated as to encroach upon the cavity of the pelvis, and mechanically obstruct the passage of the child. Even those in which this does not occur are by no means free from danger, for interstitial and subperitoneal fibroids, situated in the upper parts of the uterus, and leaving the pelvic cavity quite unimplicated, may interfere with the action of the uterine fibres, prevent subsequent contraction, cause profuse post-partum hemorrhage, or even predispose to rupture of the uterine tissues. Hence, every case in which the existence of uterine fibroids has been ascertained must be anxiously watched. The risk of hemorrhage is perhaps the greatest; for, if the tumors be at all large, efficient contraction of the uterus after the birth of the child must be more or less interfered with. Fortunately it is not so common as might almost be expected. Out of 5 cases recorded in the "Obstetrical Transactions," 2 of which were in my own practice, no hemorrhage occurred; nor does it seem to have happened in any of the 26 cases collected by Magdelaine in his thesis on the subject. I recently saw an interesting example of this in a patient, whose case was looked forward to with much anxiety, in consequence of the existence of several enormous fibroid masses projecting from the fundus and anterior surface of the body of the uterus, and whose labor was, nevertheless, typically normal in every way. Should hemorrhage occur after delivery, the injection of styptic solutions would probably be peculiarly valuable, since the ordinary means of promoting contraction are likely to fail.

It is when the fibroid growths implicate the lower uterine zone and the cervical region that the greatest difficulties are likely to be met with. The practice then to be adopted must be regulated to a great extent by the nature of each individual case. If it be possible to push the tumor above the pelvic brim, out of the way of the presenting part, that, no doubt, is the best course to pursue, as not only clearing the passage in the most effectual way, but removing the tumor from the bruising to which it would otherwise be subjected when pressed between the head and the pelvic walls, which seems to be one of the greatest dangers of this complication. This manœuvre is sometimes possible in what seems to be the most unpromising circumstances. An interesting example is narrated by Mr. Spencer Wells,* who, called to perform the Cæsarean section, succeeded, although not without much difficulty, in pushing the obstructing mass above the brim, the child subsequently passing with ease. I have myself elsewhere recorded two similar cases,† in which I was enabled to deliver the patient by pushing up the obstructing tumor, in both of which the Cæsarean section would have been inevitable had the attempt at reposition failed. Therefore, before resorting to more serious operative procedures, a determined effort at pushing the tumor out of the way should be made, the patient being deeply chloroformed, and, if necessary, upward pressure being made by the closed fist passed into the vagina.

Enucleation or Ablation.—Failing this, the possibility of enucleating the tumor, or, if that be not possible, of removing it piecemeal with the écraseur should be considered. On account of the loose attachments of these growths, and the facility with which they can be removed in this way in the non-pregnant state, the expedient seems well worthy of a trial, if their site and attachments render it at all feasible. Interesting examples of the successful performance of this operation are recorded by Danyau and Braxton Hicks. Should it be found impracticable, the case must be managed in reference to the amount of obstruction; and the forceps, craniotomy, or even the Cæsarean section, may be necessary.

Tumors of the Ovaries.—The next most common class of obstructing tumors are those of the ovary (Fig. 82), and it is apparently not the largest of these which are most apt to descend into the pelvic cavity. When the tumor is of any considerable size, its bulk is such that it cannot be contained in the true pelvis, and it rises into the abdominal cavity with the uterus. Hence, the existence of the tumor that offers the most formidable obstacle to delivery is rarely suspected before labor sets in.

Fig. 82.



Labor Complicated by Ovarian Tumor.

In order to estimate the results of the various methods of treatment, I have tabulated 57 cases.‡ In 13 labor was terminated by the natural powers alone; but of these 6 mothers, or nearly one-half, died. In favorable contrast with these we have the cases in which the size of the tumor was diminished by puncture. These are 9 in number, in all of which the mother recovered; 6 out of the 9 children being saved. The reason of the great mortality in the former cases is apparently the bruising to which the tumor, even when small enough to allow the child to be squeezed past it, is

* Obst. Trans., vol. ix., p. 73. † Obst. Trans., vol. xix., p. 101.
‡ Obst. Trans., vol. ix.

necessarily subjected. This is extremely apt to set up a fatal form of diffuse inflammation, the risk of which was long ago pointed out by Ashwell,* who draws a comparison between cases in which such tumors have been subjected to contusion and cases of strangulated hernia; and the cause of death in both is doubtless very similar. This danger is avoided when the tumor is punctured, so as to become flattened between the head and the pelvic walls. On this account, I think, it should be laid down as a rule that puncture should be performed in all cases of ovarian tumor engaged in front of the presenting part, even when it is of so small a size as not to preclude the possibility of delivery by the natural powers.

Treatment when Puncture Fails.—In 5 of the 57 cases it was found possible to return the tumor above the pelvic brim, and in these also the termination was very favorable, all the mothers recovering. Should puncture not succeed, and it may fail on account of the gelatinous and semi-solid nature of the contents of the cyst, it may be possible to dispose of the tumor in this way, even when it seems to be firmly wedged down in front of the presenting part, and to be hopelessly fixed in its unfavorable position.

Failing either of these resources, it may be necessary to resort to craniotomy, provided the size of the tumor precludes the possibility of delivery by forceps.

The question of the effect on labor of ovarian tumor which does not obstruct the pelvic canal is one of some interest, but there are not a sufficient number of cases recorded to throw much light on it. I am disposed to think that labor generally goes on favorably. What delay there is depends on the inefficient action of the accessory muscles engaged in parturition, on account of the extreme distension of the abdomen.

There are a few other conditions, connected with the maternal structures, which may impede delivery, but which are of comparatively rare occurrence.

Vaginal Cystocele.—Amongst them is vaginal cystocele, consisting of a prolapse of the distended bladder in front of the presentation, where it forms a tense, fluctuating pouch, which has been mistaken for an hydrocephalic head, or for the bag of membranes. This complication is only likely to arise when the bladder has been allowed to become unduly distended from want of attention to the voiding of urine during labor. The diagnosis should not offer any difficulty, for the finger will be able to pass behind, but not in front of, the swelling, and reach the presenting part; while the pain and tenesmus will further put the practitioner on his guard. The treatment consists in emptying the bladder; but there may be some difficulty in passing the catheter in consequence of the urethra being dragged out of its natural direction. A long elastic male catheter will almost always pass, if used with care and gentleness. Should it be found impossible to draw off the water, and this is said to have sometimes happened, the tense pouch might be punctured without danger by the fine needle of an aspirator trocar, and its contents withdrawn. When once the viscus is emptied, it can easily be pushed above the presenting part in the intervals between the pains.

Vesical Calculus.—In some few cases difficulties have arisen from the existence of a vesical calculus. Should this be pushed down in front of the head, it can readily be understood that the maternal structures would run the risk of being seriously bruised and injured. Should we make out the existence of a calculus—and, if the presence of one be suspected, the diagnosis could easily be made by means of a sound—an endeavor should be made to push it above the brim of the pelvis. If that be found to be impossible, no resource is left but its removal, either by crushing, or by rapid dilatation of the urethra, followed by extraction. Should we be aware of the existence of a calculus during pregnancy, its removal should certainly be undertaken before labor sets in.

Hernial protrusion in Douglas' space may sometimes give rise to anxiety from the pressure and contusion to which it is necessarily subjected. An endeavor must be made to replace it, and to moderate the straining efforts of the patient; and it may be even advisable to apply the forceps so as to relieve the mass from pressure as soon as possible. It is, however, of great rarity. Fordyce Barker, in an interesting paper on the subject,* records several examples, and states that he has met with no instance in which it has led to a fatal result either to mother or child, although it cannot but be considered a serious complication.

Scybalous masses in the intestines may be so hard and impacted as to form an obstruction. The necessity of attending to the state of the rectum has already been pointed out. Should it be found impossible to empty the bowel by large enemata, the mass must be mechanically broken down and removed by the scoop.

Œdema of the Vulva.—Excessive œdematous infiltration of the vulva may sometimes cause obstruction, and require diminution in size, which can be easily effected by numerous small punctures.

Hæmatic effusions into the cellular tissue of the vulva or vagina form a grave complication of labor. Such blood swellings are most usually met with in one or both labia, or under the vaginal wall; in the gravest forms, the blood may extend into the tissues for a considerable distance, as in the case recorded by Cazeaux, where it reached upwards as far as the umbilicus in front, and as far as the attachment of the diaphragm behind.

Conditions Favoring the Accident.—The conditions associated with pregnancy, the distension and engorgement to which the vessels are subjected, the interference with the return of the blood by the pressure of the head during labor, and the violent efforts of the patient, afforded a ready explanation of the reason why a vessel may be predisposed to rupture and admit of the extravasation of blood.

The accident is fortunately far from a common one, although a sufficient number of cases are recorded to make us familiar with its symptoms and risks. The dangers attending such effusions would seem to be great, if the statistics given by those who have written on the subject are to be trusted. Thus, out of 124 cases collected by various French authors, 44 proved fatal. Fordyce Barker points out that, since the nature and appropriate treatment of the accident have been more thoroughly understood, the mortality has been much lessened; for out of 15 cases reported by Scanzoni only 1 died, and out of 22 cases he had himself seen 2 died, and all these three deaths were from puerperal fever, and not the direct result of the accident.†

Situation of the Blood Effusion.—The blood may be effused into any part of the pelvic cellular tissue, or into the labia. The accident most often happens during labor when the head is low down in the pelvis, not unfrequently just as it is about to escape from the vulva. Hence the extravasation is more often met with low down in the vagina, and more frequently in one of the labia than in any other situation. I have met with a case in which I had every reason to believe that an extravasation of blood had occurred within the tissues immediately surrounding the cervix. It is natural to suppose that a varicose condition of the veins about the vulva would predispose to the accident, but in most of the recorded examples this is not stated to have been the case. Still, if varicose veins exist to any marked degree, some anxiety on this point cannot but be felt.

Time of Occurrence.—The thrombus occasionally, though rarely, forms before delivery. Most commonly it first forms towards the end of labor, or after the birth of the child. In the latter case, it is probable that the laceration in the vessels occurred before the birth of the child, and that the pressure of the presenting part prevented the escape of any quantity of blood at the time of laceration.

Symptoms.—The symptoms are not by any means characteristic. Pain of a tearing character, occasionally very intense, and extending to the back and down the thighs, is very generally associated with the formation of the thrombus. If a careful physical examination be made, the nature of the case can readily be detected.

* Guy's Hospital Reports, vol. ii.

* Amer. Journ. of Obstetrics, vol. ix. † The Puerperal Diseases, p. 60.

When the blood escapes into the labium, a firm, hard swelling is felt, which has even been mistaken for the fœtal head. If the effusion implicate the internal parts only, the diagnosis may not at first be so evident. But even then a little care should prevent any mistake, for the swelling may be felt in the vagina, and may even form an obstacle to the passage of the child. Cazeaux mentions cases in which it was so extensive as to compress the rectum and urethra, and even to prevent the exit of the lochia. In some cases the distension of the tissues is so great that they lacerate, and then hemorrhage, sometimes so profuse as directly to imperil the life of the patient, may occur. The bursting of the skin may take place some time subsequent to the formation of the thrombus. Constitutional symptoms will be in proportion to the amount of blood lost, either by extravasation or externally, after the rupture of the superficial tissues. Occasionally they are considerable, and are the same as those of hemorrhage from any cause.

Termination.—The terminations of thrombus are either spontaneous absorption, which may occur if the amount of blood extravasated be small, or the tumor may burst, and then there is external hemorrhage; or it may suppurate, the contained coagula being discharged from the cavity of the cyst; or finally sloughing of the superficial tissues has occurred.

Treatment.—The treatment must naturally vary with the size of the thrombus, and the time at which it forms. If it be met with during labor, unless it be extremely small, it will be very apt to form an obstruction to the passage of the child. Under such circumstances it is clearly advisable to terminate the labor as soon as possible, so as to remove the obstacle to the circulation in the vessels. For this purpose the forceps should be applied as soon as the head can be easily reached. If the tumor itself obstruct the passage of the head, or if it be of any considerable size, it will be necessary to incise it freely at its most prominent point and turn out the coagula, controlling the hemorrhage at once by filling the cavity with cotton wadding saturated in a solution of perchloride of iron, while at the same time digital compression with the tips of the fingers is kept up. By this means pressure is applied directly to the bleeding point, and the hemorrhage can be controlled without difficulty. This is all the more necessary if spontaneous rupture have taken place, for then the loss of blood is often profuse, and it is of the utmost importance to reach the site of the hemorrhage as nearly as possible.

If the thrombus be not so large as to obstruct delivery, or if it be not detected until after the birth of the child, the question arises whether the case should not be left alone, in the hope that absorption may occur, as in most cases of pelvic hæmatocele. This expectant treatment is advised by Cazeaux, and it seems to be the most rational plan we can adopt. True, it may take a longer time for the patient to convalesce completely than if the coagula were removed at once, and the hemorrhage restrained by pressure on the bleeding point; but this disadvantage is more than counterbalanced by the absence of risk from hemorrhage, and of septicæmia from the suppuration that must necessarily follow. Softening and suppuration may in many cases occur in a few days, necessitating operation, but the vessels will then be probably occluded, and the risk of hemorrhage much lessened. Dr. Fordyce Barker, however, holds the opposite opinion, and thinks that the proper plan is to open the thrombus early, controlling the hemorrhage in the manner already indicated, unless the thrombus is situated high in the vaginal canal.

Risk of Subsequent Septicæmia.—Whenever the cavity of a thrombus has been opened, either by incision or by spontaneous softening at some time subsequent to its formation, it must not be forgotten that there is considerable risk of septic absorption. To avoid this, care must be taken to use antiseptic dressings freely, such as the glycerine of carbolic acid applied directly to the part, and frequent vaginal injections of diluted Condy's fluid. Barker lays special stress on the importance of not removing prematurely the coagula formed by the styptic applications, for fear of secondary hemorrhage, but of allowing them to come away spontaneously.

SECTION XI.

DIFFICULT LABOR DEPENDING ON SOME UNUSUAL CONDITION OF THE FŒTUS.

Plural Births.—The subject of multiple pregnancy in general having already been fully considered, we have now only to discuss its practical bearing as regards labor. Fortunately the existence of twins rarely gives rise to any serious difficulty. In the large proportion of cases the presence of a second fœtus is not suspected until the birth of the first, when the nature of the case is at once apparent from the fact of the uterus remaining as large, or nearly as large, as it was before.

There may possibly be some delay in the birth of the first child, inasmuch as the extreme distension of the uterus may interfere with its thoroughly efficient action; while, in addition, the uterine pressure is not directly conveyed to the ovum as in single births, but indirectly through the amniotic sac of the second child (Fig. 83). Such delay is especially apt to arise when the first child presents by the breech, for, even if the body be expelled spontaneously, difficulty is likely to occur with the head, since the uterus does not contract upon it as is ordinarily the case. Hence the intervention of the accoucheur to save the life of the child, by the extraction of the head, will be almost a matter of necessity.

Fig. 83.

Twin Pregnancy, Breech and Head Presenting.

In the majority of cases, after the birth of the first child, there is a temporary lull in the pains, which soon recommence, generally in from ten to twenty minutes, and the second child is rapidly expelled; for on account of the full dilatation of the soft parts, there is no obstacle to its delivery. Sometimes there is a considerable interval before the pains recur, and instances are recorded in which even several days have elapsed between the births of the two children.

Treatment.—In most cases the management of twins does not differ from that of ordinary labor. As soon as we are certain of the existence of a second fœtus, we should inform the bystanders, but not necessarily the mother, to whom the news might prove an unpleasant and even dangerous shock. Then having taken care to tie the cord of the first child for fear of vascular communication between the placentæ, our duty is to wait for a recurrence of the pains. If these come on rapidly, and the presentation of the second fœtus be normal, its birth is managed in the usual way.

Management when there is Delay After the Birth of the First Child.—If there be any unusual delay, we have to consider the proper course to pursue, and on this the opinions of authorities differ greatly. Some advise a delay of several hours, and even more, if pains do not recur spontaneously; while others, Murphy for example, recommend that the second child should be delivered at once. Either extreme of practice is probably wrong, and the safest and best course is, doubtless, the medium one. The second point to bear in mind is, that, in multiple pregnancy, on account of the extreme distension of the uterus, there is a tendency to inertia, and consequently to post-partum hemorrhage; and that, therefore, it is better that the birth of the second child should be delayed, even for a considerable time, rather than that the patient should run the risk attending an empty and uncontracted uterus. If, however, uterine action be present, there is an obvious advantage in the delivery of the second child before the dilatation of the passages passes off.

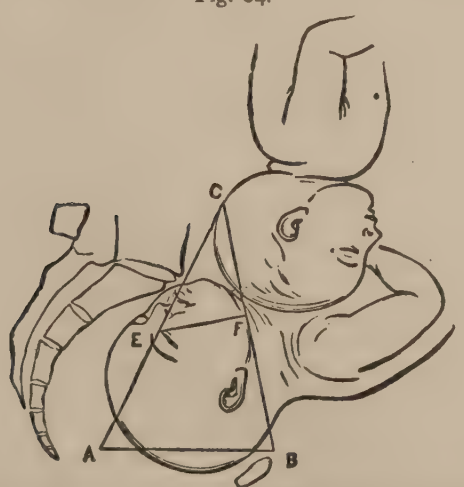
Endeavors shoula be Made to Excite Uterine Action.—The best plan would seem to be, if, after waiting a quarter of an hour, labor pains do not occur, to try and induce them by uterine friction and

pressure, and by the administration of a dose of ergot, to which, as there can be no obstacle to the rapid birth of the second child, there can be now no objection. The membranes of the second child should always be ruptured at once, if easily within reach, as one of the speediest means of inducing contraction. If no progress be made, and speedy delivery be indicated—a necessity which may arise either from the exhausted state of the patient, the presence of hemorrhage, extremely feeble pulsations of the fœtal heart (showing that the life of the second child is endangered), or malpresentations of the second fœtus—turning is probably the readiest and safest expedient. Under such circumstances the operation is performed with great ease, since the passages are amply dilated. After bringing down the feet, the birth of the body should be slowly effected, with the view of insuring as complete subsequent contraction as possible. If the head has descended in the pelvis, of course turning is impossible, and the forceps must be applied.

Difficulties Arising from Locked Twins.—Occasionally very serious difficulties arise from parts of both fœtuses presenting simultaneously, and either thus impeding the entrance of either child into the pelvis, or getting locked together, so as to render delivery impossible without artificial aid. Such difficulties are not apt to arise in the more ordinary cases, in which each child has its own bag of membranes, since then the fœtuses are kept entirely separate; but in those in which the twins are contained in a common amniotic cavity, or in which both sacs have burst simultaneously. They are very puzzling to the obstetrician, and it may be far from easy to discover the cause of the obstruction. Nor is it possible to lay down any positive rules for their management, which must be governed, to a considerable extent, by the circumstances of each individual case.

Nature of these Cases.—Sometimes both heads present simultaneously at the brim, and then neither can enter unless they be unusually small or the pelvis very capacious, when both may descend; or rather the first head may descend low into the pelvic cavity, and then the second head enters the brim, and gets jammed against the thorax of the first child (Fig. 84). Reimann* relates a

Fig. 84.



Shows Head-locking, both Children presenting Head first. (After Barnes.)

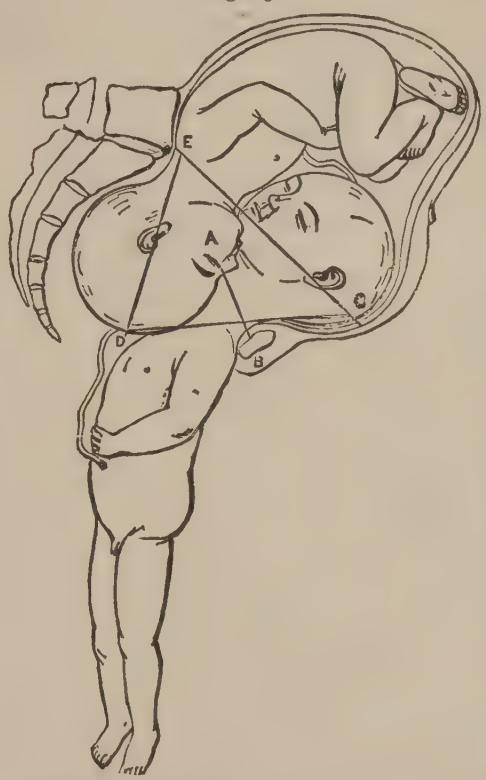
curious example of this, in which he delivered the first head with the forceps, but found the body would not follow, and, on examination, a second head was found in the pelvis. He then applied the forceps to the second head; the body of the first child was then born, and afterwards that of the second. Such a mechanism must clearly have been impossible unless the pelvis had been extremely large.

Both Heads Presenting Simultaneously.—Whenever both heads are felt at the brim, it will generally be found possible to get one out of the way by appropriate manipulation, one hand being passed into the vagina, the other aiding its action from without. Then the forceps may be applied to the other head, so as to engage it at once in the pelvic cavity. If both have actually passed into the pelvis, as in the case just alluded to, the difficulty will be much greater. It will generally be easier to push up the second head, while the lower is drawn out by the forceps, than to deliver the second, leaving the first *in situ*.

Foot or Hand with Head.—In other cases a foot or a hand may descend along with the head, and even the four feet may present simultaneously. The rule in the former case is to push the part descending with the head out of the way, and, in the latter, to disengage one child as soon as possible. Great care is necessary, or we might possibly bring down the limbs of separate children.

Two Heads Interlocking.—The most common kind of difficulty is when the first child presents by the breech, and is delivered as far as the head, which is then found to be locked with the head of the second child, which has descended into the pelvic cavity (Fig. 85).

Fig. 85.



Shows Head-locking, first Child coming Feet first; Impaction of Heads from Wedging in Brim. (After Barnes.)

D. Apex of wedge. E, C. Base of wedge which cannot enter brim. A, B. Line of decapitation to decompose wedge, and enable head of second child to pass.

Here it is clear that the obstruction must be very great, and, unless the children are extremely small, insuperable. The first endeavor should be to disentangle the heads; this is sometimes feasible if the second be not deeply engaged in the pelvis, and the hand be passed up so as to push it out of the way. This will but rarely succeed; then it may be possible to apply the forceps to the second head and drag it past the body of the first child, and this is the method recommended by Reimann, who has written an excellent paper on the subject.* Generally the sacrifice of one of the children is essential, and as the body of the first child must have been born for some time, it is probable that the pressure to which it has been subjected will have already imperilled, if it have not destroyed, its life, and therefore the plan usually recommended is to decapitate. This can easily be done with scissors or a wire écraseur, after which the second child is expelled without difficulty, leaving the head of the first in utero to be subsequently dealt with.

* Arch. f. Gynak., 1871.

* American Journal of Obstetrics, January, 1877.

Another mode of managing these cases is, to perforate the upper head and draw it past the lower with the cephalotribe or craniotomy forceps. This plan has the disadvantage of probably sacrificing both children, since the other child can hardly survive the pressure and delay, whereas the former plan gives the second child a fair chance of being born alive.

Double Monsters.—In connection with the subject of twin labor we may consider those rare cases in which the bodies of the fœtuses are partially fused together. The mechanism and management of delivery in cases of double monstrosity have attracted comparatively little attention, no doubt because authors have considered them matters of curiosity merely, rather than of practical importance.

The frequent occurrence of such monstrosities in our museums, and the numerous cases scattered through our periodical literature, are sufficient to show that they are not so very rare as we might be inclined to imagine; and, as they are likely to give rise to formidable difficulties in delivery, it cannot be unimportant to have a clear idea of the usual course taken by nature in effecting such births, with a view of enabling us to assist in the most satisfactory manner should a similar case come under our observation.

Unfortunately, the authors who have placed on record the birth of double monsters have generally occupied themselves more with a description of the structural peculiarities of the fœtuses than with the mechanism of their delivery; so that, although the cases to be met with in medical literature are very numerous, comparatively few of them are of real value from an obstetric point of view. Still, I have been able to collect the details of a considerable number* in which the history of the labor is more or less accurately described; and doubtless a more extensive research would increase the list.

For obstetric purposes we may confine our attention to four principal varieties of double monstrosity, which are met with far more frequently than any others. These are:—

A. Two nearly separate bodies united in front, to a varying extent, by thorax or abdomen.

B. Two nearly separate bodies united back to back by the sacrum and lower part of the spinal column.

C. Dicephalous monsters, the bodies being single below, but the heads separate.

D. The bodies separate below, but the heads fixed are partially united.

This classification by no means includes all the varieties of monsters that we may meet with. It does, however, include all that are likely to give rise to much difficulty in delivery; and all the cases I have collected may be placed under one of these divisions.

The first point that strikes us in looking over the history of these deliveries is the frequency with which they have been terminated by the natural powers alone, without any assistance on the part of the accoucheur. Thus, out of the 31 cases no less than 20 were delivered naturally, and apparently without much trouble. Nothing can better show the wonderful resources of nature in overcoming difficulties of a very formidable kind.

It is pretty generally assumed by authors that the children are necessarily premature, and therefore of small size, and that delivery before the full term is rather the rule than the exception. Dugés states that the children are often dead, and that putrefaction has taken place, which facilitates their expulsion. Both these assumptions seem to me to have been made without sufficient authority, and not to be borne out by the recorded facts. In only 1 of the 31 cases is it mentioned that the children were premature; nor is there any sufficient reason that I can see why labor should commence before the full term of gestation.

Class A.—By far the greatest number are included in the first class—that in which the bodies are nearly separate, but united by some part of the thorax or abdomen. This is the division which includes the celebrated Siamese Twins, an account of whose birth, I may observe, I have not been able to discover. Out of the 31 cases, 19 come under this heading. The details of the labor are briefly as follows:—1 died undelivered; 8 were terminated by the natural powers, in 3 of which the feet, and in 3 the head presented; in 2 the presentation is doubtful; 6 were delivered by turning, or by traction on the lower extremities; 4 were delivered instrumentally.

Footling Presentation is the Most Favorable.—The details of the cases in which the feet presented, or in which turning was performed, clearly show that footling presentation was by far the most favorable, and it is fortunate the feet often present naturally. The inference, of course, is, that version should be resorted to whenever any other presentation is met with in cases of double monstrosity of this type; but, unfortunately, this rule could rarely be carried into execution, since we possess no means of diagnosing the junction of the fœtuses at a sufficiently early stage of labor to admit of turning being performed. It is only under exceptionably favorable circumstances that this can be done; as, for example, in a case recorded by Molas,* in which both heads presented, but neither would enter the brim of the pelvis.

The Chief Difficulty is in the Delivery of the Heads.—The great difficulty must of course be in the delivery of the heads; for in all the recorded cases, with one exception, the bodies have passed through the pelvis parallel to each other with comparative ease until the necks have appeared, and then, as a rule, they could be brought no farther. It is clear that the remainder of the fœtuses could no longer pass simultaneously; and, were direct traction continued, the heads would be inextricably fixed above the brim. In accordance with the direction of the pelvic axes the posterior head must first engage in the inlet; and in order to effect this, it will be necessary to carry the bodies of the children well over the abdomen of the mother. This seems to be a point of primary importance. It would also be advisable to see that the bodies are made to pass through the pelvis with their backs in the oblique diameter. By this means more space is gained than if the backs were placed antero-posteriorly; while, at the same time, there is less chance of the heads hitching against the promontory of the sacrum and symphysis pubis, which otherwise would be very apt to occur.

Mode of Delivery when the Head Presents.—When the head presents, and the labor is terminated by the natural powers, delivery seems to be accomplished in one of two ways.

In the first and more common, the head and shoulders of one child are born, its breech and legs being subsequently pushed through the pelvis by a process similar to that of spontaneous evolution; and, afterwards, the second child probably passes footling without much difficulty.

Barkow relates a case in which *both* heads were delivered by the forceps, the bodies subsequently passing simultaneously. Two similar instances are recorded in the third and sixth volumes of the "Obstetrical Transactions." When delivery takes place in this manner, the head of the second child must fit into the cavity formed by the neck of the first, and the pelvis must necessarily be sufficiently roomy to admit of the expulsion of the head of the second child, while its cavity is diminished in size by the presence of the neck and shoulders of the first. Either of these processes must obviously require exceptionally favorable conditions as regards the size of the child and the pelvis; and the difficulty in the way of delivery must be much greater than when the lower extremities present. Therefore, I think the rule should be laid down that, when the nature of the case is made out (and for the purpose of accurate diagnosis a complete examination under anæsthesia should be practised), turning should be performed, and the feet brought down.

Mutilation of the Fœtuses.—In the event of its being found impossible to effect delivery after a considerable portion of the bodies

* Obstet. Trans., vol. viii.

* Mem. de l'Academie, vol. i.

is born, no resource remains but the mutilation of the body of one child, so as to admit of the passage of the other. This was found necessary in one case in which the children presented by the feet, and were born as far as the thorax, but could get no further. The body of the anterior child was removed by a circular incision as far as it had been expelled, which allowed the remaining portion, consisting of the head and shoulders, to re-enter the uterus; after this the posterior child was easily extracted, and the mutilated fœtus followed without difficulty.

Class B.—In class B, in which the children are united back to back, 3 cases are recorded, all of which were delivered by the natural powers. One of these is the case of Judith and Hélène, the celebrated Hungarian twins, who lived to the age of twenty-one.* Hélène was born as far as the umbilicus, and, after the lapse of three hours, her breech and legs descended. Judith was expelled immediately afterwards, her feet descending first. Exactly the same process occurred in a case described by M. Norman, the children being also born alive, and dying on the ninth day.

Labor is Easier than in Class A.—It is probable that labor is easier in this class of double monsters than in the former, because the children are so joined that there is no necessity for the bodies to be parallel to each other during birth when the head presents, and after the birth of the head and shoulders of the first child, its breech and lower extremities are evidently pushed down and expelled by a process of spontaneous evolution. If the feet originally presented, the mechanism of delivery and the rules to be followed would be the same as in class A; but the difficulty would probably be greater, since the juncture is not so flexible, and a more complete parallelism of the bodies would be necessary during extraction.

Class C.—In class C, that of the dicephalous monster, I have found the description of the birth of 8 cases, 3 of which were terminated by the natural powers. In two of these the process of evolution was the main agent in delivery; one head being born and becoming fixed under the arch of the pubis, the body being subsequently pushed past it, and the second head following without difficulty. This process failing, the proper course is to decapitate the first born head, and then bring down the feet of the child, when delivery can be accomplished with ease. This was the course adopted in 2 out of the 8 cases; and it may be done with the less hesitation, since, from their structural peculiarities, it is extremely improbable that monsters of this kind should survive. In the third case, terminated naturally, the heads were said to have been born simultaneously, but it seems probable that the one head lay in the hollow formed by the neck of the other, and so rapidly followed it. If the feet presented, the case may be managed in the same manner as in class A.

Class D.—Monstrosities of class D, in which the heads are united, the bodies being distinct, appear to be the most uncommon of all; and I can find the description of delivery in only 2 cases. One of these gave rise to great difficulty; the labor in the other was easy. We should scarcely anticipate much difficulty in the birth of monsters of this type; for, if the head presented and would not pass, we should naturally perform craniotomy; and if the bodies come first, the delivery of the monstrous head could readily be accomplished by perforation.

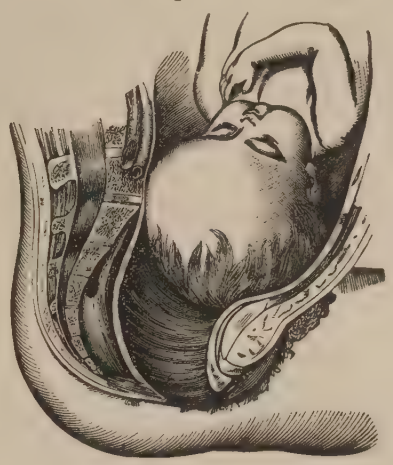
Result to the Mothers.—The result to the mothers in all these cases seems to have been very favorable. There is only one in which the death of the mother is recorded; and although in many the result is not mentioned, we may fairly assume that recovery took place.

Among difficulties in labor, some of the most important are due to morbid conditions of the fœtus itself.

Intra-uterine Hydrocephalus.—Of these the most common, as well as the most serious, is caused by intra-uterine hydrocephalus (giving rise to a collection of watery fluid within the cranium), by which the dimensions of the child's head are enormously increased, and the due relations between it and the pelvic cavity entirely destroyed (Fig. 86).

Its Danger both as Regards the Mother and Child.—Fortunately, this disease is of comparatively rare occurrence, for it is one of great gravity both as regards the mother and child. As regards the mother, the serious character of the complication is proved by the statistics of Dr. Keiller, of Edinburgh, who found that, out of 74 cases, no less than 16 were accompanied by rupture of the uterus. The reason of the danger to which the mother is subjected is obvious. In some few cases, indeed, the head is so compressible that, provided the amount of contained fluid be small, it may be sufficiently diminished in size, by the moulding to which it is subjected, to admit of its being squeezed through the pelvis. In the majority of cases, however, the size of the head is too great for

Fig. 86.



Labor Impeded by Hydrocephalus.

this to occur. The uterus therefore exhausts itself, and may even rupture, in the vain endeavor to overcome the obstacle; while the large and distended head presses firmly on the cervix, or on the pelvic tissues, if the os be dilated, and all the evil effects of prolonged compression are apt to follow.

Its Diagnosis is not always Easy.—The diagnosis of intra-uterine hydrocephalus is by no means so easy as the description in obstetric works would lead us to believe. It is true that the head is much larger and more rounded in its contour than the healthy fœtal cranium, and also that the sutures and fontanelles are more wide, and admit occasionally of fluctuation being perceived through them. Still, it is to be remembered that the head is always arrested above the brim, where it is consequently high up and difficult to reach, and where these peculiarities are made out with much difficulty. As a matter of fact, the true nature of the case is comparatively rarely discovered before delivery; thus Chaussier* found that in more than one-half of the cases he collected an erroneous diagnosis had been made.

Method of Diagnosis.—Whenever we meet with a case in which either the history of previous labor, or a careful examination, convinces us that there is no obstacle due to pelvic deformity, in which the pains are strong and forcing, but in which the head persistently refuses to engage in the brim, we may fairly surmise the existence of hydrocephalus. Nothing, however, short of a careful examination under anæsthesia, the whole hand being passed into the vagina so as to explore the presenting part thoroughly, will enable us to be quite sure of the existence of this complication. Under these circumstances such a complete examination is not only justified but imperative; and, when it has been made, the difficulties of diagnosis are lessened, for then we may readily make out the large, round mass, softer and more compressible than the healthy head, the widely separated sutures, and the fluctuating fontanelles.

* Born, Oct. 26, 1701; died, Feb. 8, 1723.

* Gazette Medicale, 1864.

Pelvic Presentations are Frequently met with.—In a considerable proportion of cases—as many, it is said, as 1 out of 5—the fœtus presents by the breech. The diagnosis is then still more difficult; for the labor progresses easily until the shoulders are born, when the head is completely arrested, and refuses to pass with any amount of traction that is brought to bear on it. Even the most careful examination may not now enable us to make out the cause of the delay, for the finger will impinge on the comparatively firm base of the skull, and may be unable to reach the distended portion of the cranium. At this time abdominal palpation might throw some light on the case, for the uterus being tightly contracted round the head, we might be able to make out its unusual dimensions. The wasted and shrivelled appearance of the child's body, which so often accompanies hydrocephalus, would also arouse suspicion as to the cause of delay. On the whole, such cases may be fairly assumed to be less dangerous to the mother than when the head presents; for, in the latter, the soft parts are apt to be subjected to prolonged pressure and contusion; while in the former, delay does not commence till after the shoulders are born, and then the character of the obstacle would be sooner discovered, and appropriate means earlier taken to overcome it.

Treatment.—The treatment is simple, and consists in tapping the head, so as to allow the cranial bones to collapse. There is the less objection to this course, since the disease almost necessarily precludes the hope of the child's surviving. The aspirator would draw off the fluid effectually, and would at least give the child a chance of life; and, under certain circumstances, the birth of the child, who lives for a short time only, may be of extreme legal importance. More generally the perforator will be used, and as soon as it has penetrated, a gush of fluid will at once verify the diagnosis. Schroeder recommends that, after perforation, turning should be performed, on account of the difficulty with which the flaccid head is propelled through the pelvis. This seems a very unnecessary complication of an already sufficiently troublesome case. As a rule, when once the fluid has been evacuated, the pains being strong, as they generally are, no delay need be apprehended. Should the head not come down, the cephalotribe may be applied, which takes a firmer grasp than the forceps, and enables the head to be crushed to a very small size and readily extracted.

Treatment when the Breech Presents.—When the breech presents, the head must be perforated through the occipital bone, and generally this may be accomplished behind the ear without much difficulty. In a case of Tarnier's * the vertebral column was divided by a bistoury and an elastic male catheter introduced into the vertebral canal, through which the intra-cranial fluid escaped, the labor being terminated spontaneously. In any case in which it is found difficult to reach the skull with the perforator this procedure should certainly be tried.

Other forms of dropsical effusion may give rise to some difficulty, but by no means so serious. In a few rare cases the thorax has been so distended with fluid as to obstruct the passage of the child. Ascites is somewhat more common; and, occasionally, the child's bladder is so distended with urine as to prevent the birth of the body. The existence of any of these conditions is easily ascertained; for the head or breech, whichever happens to be present, is delivered without difficulty, and then the rest of the body is arrested. This will naturally cause the practitioner to make a careful exploration, when the cause of the delay will be detected.

This treatment consists in the evacuation of the fluid by puncture. In the case of ascites, this should always be done, if possible, by a fine trocar or aspirator, so as not to injure the child. This is all the more important since it is impossible to distinguish a distended bladder from ascites, and an opening of any size into that viscus might prove fatal, whereas aspiration would do little or no harm, and would prove quite as efficacious.

Fœtal Tumors Obstructing Delivery.—Certain fœtal tumors may occasion dystocia, such as malignant growths, or tumors of the kidney, liver, or spleen. Cases of this kind are recorded in most obstetric works. Hydro-encephacele, or hydro-rachitis, depending on defective formation of the cranial or spinal bones, with the formation of a large protruding bag of fluid, is not very rare. The diagnosis of all such cases is somewhat obscure, nor is it possible to lay down any definite rules for their management, which must vary according to the particular exigencies. The tumors are rarely of sufficient size to prove formidable obstacles to delivery, and many of them are very compressible. This is especially the case with spina bifida and similar cystic growths. Puncture, and in the more solid growths of the abdomen or thorax, evisceration may be required.

Other Congenital Deformities.—Other deformities, such as the anencephalous fœtus, or defective development of the thorax or abdominal parietes with protrusion of the viscera, are not likely to cause any difficulty; but they may much embarrass the diagnosis by the strange and unusual presentation that is felt. If, in any case of doubt, a full and careful examination be undertaken, introducing the whole hand if necessary, no serious mistake is likely to be made.

Dystocia from Excessive Development of the Fœtus.—In addition to dystocia from morbid conditions of the fœtus, difficulties may arise from its undue development, and especially from excessive size and advanced ossification of the skull. This last is especially likely to cause delay. Even the slight difference in size between the male and female head was found by Simpson to have an appreciable effect in increasing the difficulty of labor, when the statistics of a large number of cases were taken into account; for he proved beyond doubt that the difficulties and casualties of labor occurred in decidedly larger proportion in male than in female births. Other circumstances, besides sex, have an important effect on the size of the child. Thus Duncan and Hecker have shown that it increases in proportion to the age of the mother and the frequency of the labors, while the size of the parents has no doubt also an important bearing on the subject.

Although these influences modify the results of labor *en masse*, they have little or no practical bearing on any particular case, since it is impossible to estimate either the size of the head or the degree of its ossification until labor is advanced.

Its Treatment.—When labor is retarded by undue ossification or large size of the head, the case must be treated on the same general principles which guide us when the want of proportion is caused by pelvic contraction. Hence, if delay arise, which the natural powers are insufficient to overcome, it will seldom happen that the disproportion is too great for the forceps to overcome. If we fail to deliver by it, no resource is left but perforation.

Large Size of the Body Rarely Causes Delay.—Large size of the body of the child is still more rarely a cause of difficulty, for, if the head be born, the compressible trunk will almost always follow. Still, a few authentic cases are on record, in which it was found impossible to extract the fœtus on account of the unusual bulk of its shoulders and thorax. Should the body remain firmly impacted after the birth of the head, it is easy to assist its delivery by traction on the axillæ, by gently aiding the rotation of the shoulders into the antero-posterior diameter of the pelvic cavity, and, if necessary, by extracting the arms, so as to lessen the bulk of the part of the body contained in the pelvis. Hicks relates a case in which evisceration was required for no other apparent reason than the enormous size of the body. The necessity for any such extreme measure must, of course, be of the greatest possible rarity; and it is quite exceptional for difficulty from this source to be beyond the powers of nature to overcome.

SECTION XII.

DEFORMITIES OF THE PELVIS.

Deformities of the pelvis form one of the most important subjects of obstetric study, for from them arise some of the gravest difficulties and dangers connected with parturition. A knowledge,

* Hergott, Maladies Fœtales qui pendent faire obstacle à l'accouchement. Paris, 1878.

therefore, of their causes and effects, and of the best mode of detecting them, either during or before labor, is of paramount necessity; but the subject is far from easy, and it has been rendered more difficult than it need be, from over-anxiety on the part of obstetricians to force all varieties of pelvic deformities within the limits of their favorite classification.

Difficulties of Classification.—Many attempts in this direction have been made, some of which are based on the causes on which the deformities depend, others on the particular kind of deformity produced. The changes of form, however, are so various and irregular, and similar, or apparently similar, causes so constantly produce different effects, that all such endeavors have been more or less unsuccessful. For example, we find that rickets (of all causes of pelvic deformity the most important) generally produces a narrowing of the conjugate diameter of the brim; while the analogous disease, osteo-malacia, occurring in adult life, generally produces contraction of the transverse diameter, with approximation of the pubic bones, and relative or actual elongation of the conjugate diameter. We might, therefore, be tempted to classify the results of these two diseases under separate heads, did we not find that, when rickets affects children who are running about, and subject to mechanical influences similar to those acting upon patients suffering from osteo-malacia, a form of pelvis is produced hardly distinguishable from that met with in the latter disease.

Most Simple Classification.—On the whole, therefore, the most simple, as well as the most scientific, classification is that which takes as its basis the particular seat and nature of the deformity. Let us first glace at the most common causes.

Causes of Pelvic Deformity.—The key to the particular shape assumed by a deformed pelvis will be found in a knowledge of the circumstances which lead to its regular development and normal shape in a state of health. The changes produced may, almost invariably, be traced to the action of the same causes which produce a normal pelvis, but which, under certain diseased conditions of the bones or articulations, induce a more or less serious alteration in form. These have been already described in discussing the normal anatomy of the pelvis, and it will be remembered that they are chiefly the weight of the body, transmitted to the iliac bones through the sacro-iliac joints, and counter-pressure on these, acting through the acetabula. Sometimes they act in excess on bones which are healthy, but possibly smaller than usual, and the result may be the formation of certain abnormalities in the size of the various pelvic diameters. At other times they operate on bones which are softened and altered in texture by disease, and which, therefore, yield to the pressure far more than healthy bones.

The two diseases which chiefly operate in causing deformity are rickets and osteo-malacia. Into the essential nature and symptomatology of these complaints it would be out of place to enter here; it may suffice to remind the reader that they are believed to be pathologically similar diseases, with the important practical distinction that the former occurs in early life before the bones are completely ossified, and that the latter is a disease of adults producing softening in bones that have been hardened and developed. This difference affords a ready explanation of the generally resulting varieties of pelvic deformity.

Effects of Rickets.—Rickets commences very early in life, sometimes, it is believed, even in utero. It rarely produces softening of the entire bones, and only in cases of very great severity of those parts of the bones that have been already ossified. The effects of the disease are principally apparent in the cartilaginous portions of the bones, in which osseous deposit has not yet taken place. The bones, therefore, are not subject to uniform change, and this fact has an important influence in determining their shape. Rickety children also have imperfect muscular development; they do not run about in the same way as other children; they are often continuously in the recumbent or sitting postures, and thus the weight of the trunk is brought to bear, more than in a state of health, on the softened bones. For the same reason counter-pressure through the acetabula is absent or comparatively slight. When, however, the disease occurs for the first time in children who are able to run about, the latter comes into operation, and modifies the amount and nature of the deformity. It is to be observed that in rickety children the bones are not only altered in form from pressure, but are also imperfectly developed, and this materially modifies the deformity. When ossific matter is deposited, the bones become hard and cease to bend under external influences, and retain forever the altered shape they have assumed.

Effects of Osteo-malacia.—In osteo-malacia, on the contrary, the already hardened bones become softened uniformly through all their textures, and thus the changes which are impressed upon them are much more regular, and more easily predicated. It is, however, an infinitely less common cause of pelvic deformity than rickets, as is evidenced by the fact that in the Paris Maternity, in a period of sixteen years, 402 cases of deformity due to rickets occurred to 1 due to osteo-malacia.*

Their Varying Frequency.—The frequency of both diseases varies greatly in different countries, and under different circumstances. Rickets is much more common amongst the poor of large cities, whose children are ill-fed, badly clothed, kept in a vitiated atmosphere, and subjected to unfavorable hygienic conditions. Deformities are, therefore, more common in them than in the more healthy children of the upper classes, or of the rural population. The higher degrees of deformity, necessitating the Cæsarean section, or craniotomy, are in this country of extreme rarity; while, in certain districts on the Continent, they seem to be so frequent that these ultimate resources of the obstetric art have to be constantly employed.

Effects of Ossification of Pelvic Articulations.—In another class of cases the ordinary shape is modified by weight and counter-pressure operating on a pelvis in which one or more of the articulations is ossified. In this way we have produced the *obliquely ovate* pelvis of Naegele, or the still more uncommon *transversely contracted* pelvis of Robert.

Other Causes of Pelvic Deformity.—A certain number of deformed pelves cannot be referred to a modification of the ordinary developmental changes of the bones. Amongst these are the deformities resulting from spondylolithesis, or downward dislocation of the lower lumbar vertebræ; from displacements of the sacrum, produced by curvatures of the spinal column; or from diseases of the pelvic bones themselves, such as tumors, malignant growths, and the like.

Equally Enlarged Pelvis.—The first class of deformed pelves to be considered is that in which the diameters are altered from the usual standard, without any definite distortion of the bones; and such are often mere congenital variations in size, for which no definite explanation can be given. Of this class is the pelvis which is equally enlarged in all its diameters (*pelvis æquabiliter justo major*), which is of no obstetric consequence, except inasmuch as it may lead to precipitate labor, and is not likely to be diagnosed during life.

Equally Contracted Pelvis.—The corresponding diminution of all the pelvic diameters (*pelvis æquabiliter justo minor*) may be met with in women who are apparently well formed in every respect, and whose external conformation and previous history give no indication of the abnormality. Sometimes the diminution amounts to half an inch or more, and it can be readily understood that such a lessening in the capacity of the pelvis would give rise to serious difficulty in labor. Thus, in 3 cases recorded by Naegele a fatal result followed; in 2 after difficult instrumental delivery, and in the third after rupture of the uterus. The equally lessened pelvis, however, is of great rarity. An unusually small pelvis may be met with in connection with general small size, as in dwarfs. It does not necessarily follow, because a woman is a dwarf, that the pelvis is too small for parturition. On the contrary, many such women have borne children without difficulty.

* Stanesco, Recherches Cliniques sur les Rétrécissements du Bassin.

The Undeveloped Pelvis.—In some cases a pelvis retains its infantile characteristics after puberty (Fig. 87). The normal development of the pelvis has been interfered with possibly from premature ossification of the different portions of the innominate bones, or from arrest of their growth from a weakly or rachitic constitution. The measurements of these pelves are not always below the normal standard, they may continue to grow, although they have not developed. The proportionate measurements of the various diameters will then be as in the infant; and the antero-posterior diameter may be longer, or as long, as the transverse, the ischia comparatively near each other, and the pubic arch narrow. Such

Fig. 87.

Adult Pelvis Retaining its Infantile Type.

a form of pelvis will interfere with the mechanism of delivery, and unusual difficulty in labor will be experienced. Difficulties from a similar cause may be expected in very young girls. Here, however, there is reason to hope that, as age advances, the pelvis will develop, and subsequent labors be more easy.

Masculine or Funnel-shaped Pelvis.—The *masculine* or funnel-shaped pelvis owes its name to its approximation to the type of the male pelvis. The bones are thicker and stouter than usual, the conjugate diameter of the brim longer, and the whole cavity rendered deeper and narrower at its lower part by the nearness of the ischial tuberosities. It is generally met with in strong, muscular women following laborious occupations, and Dr. Barnes, from his experience in the Royal Maternity Charity, says that it chiefly occurs in weavers in the neighborhood of Bethnal Green, who spend most of their time in the sitting posture. "The cause of this form of pelvis seems to be an advanced condition of ossification in a pelvis which would otherwise have been *infantile*, brought about by the development of unusual muscularity, corresponding to the laborious employment of the individual." The difficulties in labor will naturally be met with towards the outlet, where the funnel shape of the cavity is most apparent.

Contraction of Conjugate Diameter of Brim.—Diminution of the antero-posterior diameter is most frequently limited to the brim, and is by far the most common variety of pelvic deformity. In its slighter degrees it is not necessarily dependent on rickets, although when more marked it almost invariably is so. When unconnected with rickets, it probably can be traced to some injurious influence before the bones have ossified, such as increased pressure of the trunk from carrying weights in early childhood, and the like. By this means the sacrum is unduly depressed, and projects forwards, so as to slightly narrow the conjugate diameter.

Mode of Production in Rickets.—When caused by rickets the amount of the contraction varies greatly, sometimes being very slight, sometimes sufficient to prevent the passage of the child altogether, and necessitate craniotomy or the Cæsarean section. The sacrum, softened by the disease, is pressed vertically downwards by the weight of the body, its descent being partially resisted by the already ossified portions of the bone, so that the result is a downward and forward movement of the promontory. The upper portion of the sacral concavity is thus directed more backwards; but, as the apex of the bone is drawn forwards by the attachment of the perineal muscles to the coccyx, and by the sacro-ischiatic ligaments, a sharp curve of its lower part in a forward direction is established.

Occasional Increase of Transverse Diameter.—The depression of the sacral promontory would tend to produce strong traction, through the sacro-iliac ligaments, on the posterior ends of the sacro-cotyloid beams, and thus induce expansion of the iliac bones, and consequent increase of the transverse diameter of the brim. So an unusual length of the transverse diameter is very often described as accompanying this deformity, but probably it is not so often apparent as might otherwise be expected, on account of the imperfect development of the bones generally accompanying rickets; and Barnes* says that in the parts of London where deformities are most rife, any enlargement of the transverse diameter is exceedingly rare. Frequently the sacrum is not only depressed, but displaced more or less to one side, most generally to the left, thus interfering with the regular shape of the deformed brim. This is often the result of a lateral flexion of the spinal column, depending on the rachitic diathesis.

Cavity of Pelvis is Generally not Affected.—In most cases of this kind the cavity of the pelvis is not diminished in size, and is often even more than usually wide. The constant pressure on the ischia, which the sitting posture of the child entails, tends to force them apart, and also to widen the pubic arch. Considerable advantage results from this in cases in which we have to perform obstetric operations, as it gives plenty of room for manipulation.

Figure-of-eight Deformity.—In a few exceptional cases the narrowing of the conjugate diameter is increased by a backward depression of the symphysis pubis, which gives the pelvic brim a sort of figure-of-eight shape (Fig. 88). The most reasonable explana-

Fig. 88.

Rickety Pelvis, with Backward Depression of the Symphysis Pubis.

tion of this peculiarity seems to be, that it is the result of the muscular contraction of the recti muscles, at their point of attachment, when the centre of gravity of the body is thrown backwards, on account of the projection of the sacral promontory. Sometimes also the antero-posterior diameter of the cavity is unusually loosened by the disappearance of the vertical curvature of the sacrum, which, instead of forming a distinct cavity, is nearly flat (Fig. 89).

Spondylolithesis.—In a few rare cases, to which attention was first called in 1853 by Kilian of Bonn, a very formidable narrowing of the conjugate diameter of the pelvic brim is produced by a downward displacement of the fourth and fifth lumbar vertebræ, which become dislocated forward, or if not actually dislocated, at least separated from their several articulations to a sufficient extent to encroach very seriously on the dimensions of the pelvic inlet. This condition is known as *spondylolithesis*. (Fig. 90).

The effect of this is sufficiently obvious, for the projection of the lumbar vertebræ prevents the passage of the child. To such an extent is obstruction thus produced, that, in the majority of the recorded cases, the Cæsarean section was necessary. The true conjugate diameter, that between the promontory of the sacrum and the symphysis pubis, is increased rather than diminished; but, for all practical purposes, the condition is similar to extreme narrowing

* Lectures on Obst. Operations, p. 280.

of the conjugate from rickets, for the bodies of the displaced vertebræ project into and obstruct the pelvic brim.

The cause of this deformity seems to be different in different cases. In some it seems to have been congenital, and in others to have depended on some antecedent disease of the bones, such as tuberculosis or scrofula, producing inflammation and softening of the connection between the last lumbar vertebra and the sacrum, thus permitting downward displacement of the bones. Lambl believed that it generally followed spina bifida, which had become partially cured, but which had produced deformity of the vertebræ, and favored their dislocation. Brodhurst,* on the other hand,

Fig. 89.

Flatness of Sacrum with Narrowing of Pelvic Cavity.

Fig. 90.

Pelvis Deformed by Spondylolithesis. (After Kilian.)

thinks that it most probably depends on rachitic inflammation and softening of the osseous and ligamentous structures, and that it is not a dislocation in the strict sense of the word.

Narrowing of the Oblique Diameter.—The most marked examples of narrowing of both oblique diameters depend on osteo-malacia. In this disease, as has already been remarked, the bones are uniformly softened; and the alterations in form are further influenced by the fact that the disease commences after union of the separate portions of the os innominatum has been completely effected. The amount of deformity in the worst cases is very great, and frequently renders delivery impossible without the Cæsarean section. Sometimes the softening of the bones proves of service in delivery, by admitting of the dilatation of the contracted pelvic diameter by the pressure of the presenting part, or even by the hand. Some curious cases are on record in which the deformity was so great as to apparently require the Cæsarean section, but in which the softened bones eventually yielded sufficiently to render this unnecessary.

Mode of Production in Osteo-malacia.—The weight of the body depresses the sacrum in a vertical direction, and at the same time compresses its component parts together, so as to approximate the base and apex of the bone, and narrow the conjugate diameter of the brim, by causing the promontory to encroach upon it. The most characteristic changes are produced by the pushing inwards of the walls of the pelvis at the cotyloid cavities, in consequence of pressure exerted at these points through the femurs. The effect of this is to diminish both oblique diameters, giving the brim somewhat the shape of a trefoil, or an ace of clubs. The sides of the pubis are at the same time approximated, and may become almost parallel, and the true conjugate may be even lengthened. The tuberosities of the ischia are also compressed together, with the rest of the lateral pelvic wall, so that the outlet is greatly deformed as well as the brim.

Obliquely Contracted Pelvis.—That form of deformity in which one oblique diameter only is lessened has received considerable attention, from having been made the subject of special study by Naegele, and is generally known as the *obliquely contracted pelvis*. It is a condition that is very rarely met with, although it is interesting from an obstetric point of view, as throwing considerable light on the mode in which the natural development of the pelvis is effected. It is difficult to diagnose, inasmuch as there is no apparent external deformity, and probably it has never, in fact, been detected before delivery. It has a very serious influence on labor; Litzmann found that out of 28 cases of this deformity, 22 died in their first labors, and 5 more in subsequent deliveries. The prognosis, therefore, is very formidable, and renders a knowledge of this distortion, rare though it be, of importance.

Its essential characteristic is flattening and want of development of one side of the pelvis, associated with anchylosis of the corresponding sacro-iliac synchondrosis. The latter is probably always present, and it seems to be most generally a congenital malformation. The lateral half of the sacrum on the same side and the entire innominate bone are much atrophied. The promontory of the sacrum is directed towards the diseased side, and the symphysis pubis is pushed over towards the healthy side.

The main agent in the production of this deformity is the absence of the sacro-iliac joint, which prevents the proper lateral expansion of the pelvic brim on that side, and allows the counter-pressure, through the femur, to push in the atrophied os innominatum to a much greater extent than usual. The chief diminution in the length of the pelvic diameter is between the ilio-pectineal eminence of the affected side and the healthy sacro-iliac joint; while the oblique diameter between the anchylosed joint and the healthy os innominatum is of normal length.

Narrowing of the Transverse Diameter.—Transverse contraction of the pelvic brim is very much less common than narrowing of the conjugate diameter. It most frequently depends on backward curvature of the lower parts of the spinal column, in consequence of disease of the vertebræ. This form of deformed pelvis is generally known as the *kyphotic*. The effect of the spinal curvature is to drag the promontory of the sacrum backwards, so that it is high up and out of reach. By this means the antero-posterior diameter of the brim is increased, while the transverse is lessened; the relative proportion between the two is thus reversed. While the upper proportion of the sacrum is displaced backwards, its lower end is projected forward, so that the antero-posterior diameters of the cavity and outlet are considerably diminished. The ischial tuberosities are also nearer to each other, and the pubic arch is narrowed. Obstruction to delivery will be chiefly met with at the lower parts and outlet of the pelvic cavity; for, although the transverse diameter of the brim is narrowed, there is generally sufficient space for the passage of the head.

Robert's Pelvis.—Another form of transversely contracted pelvis is known as *Robert's* pelvis, having been first discovered by Robert, of Coblentz. It is in fact a double obliquely contracted pelvis, depending on anchylosis of both sacro-iliac joints, and consequent defective development of the innominate bones. The shape of the pelvic brim is markedly oblong, and the sides of the pelvis are more or less parallel with each other. The outlet is also much contracted transversely. The amount of obstruction is very great, so that, according to Schroeder, out of 7 well-authenticated cases the Cæsarean section was required in 6.

Deformity from Old-standing Hip-joint Disease.—Another cause of transverse deformity, occasionally met with, is luxation of the head of the femur, depending on old-standing joint disease. The head of the femur, in this case, presses on the innominate bone at the site of dislocation, and the result is that the iliac fossa on the affected side, or both if the accident happens on both sides, is pushed inwards, the transverse diameter of the brim being lessened. The tuberosity of the ischium is, however, projected outwards, so that the outlet of the pelvis is increased rather than diminished.

Deformity from Tumors, Fractures, etc.—Obstruction of the pelvic cavity from exostosis or other forms of tumors growing from the bones is of great rarity. It may, however, produce very serious dystocia. Several curious examples are collected in Mr. Wood's article on the pelvis, in some of which the obstruction was so great as to necessitate the Cæsarean section. Some of these growths

* Obst. Trans., vol. vi. p. 97.

were true exostoses; and, according to Stadtfeldt,* these are commonly found in pelves that are otherwise contracted; others osteo-sarcomatous tumors attached to the pelvic bones, most generally the upper part of the sacrum; and others were malignant. In some cases spiculæ of bone have developed about the linea ilio-pectinea or other parts of the pelvis, which may not be sufficient to produce obstruction, but which may injure the uterus, or even the fœtal head, when they are pressed upon them. Irregular projections may also arise from the callus of old fractures of the pelvic bones. All such cases defy classification, and differ so greatly in their extent, and in their effect on labor, that no rules can be laid down for them, and each must be treated on its own merits.

Effects of Contracted Pelvis in Labor.—The effects of pelvic contractions on labor vary, of course, greatly with the amount and nature of the deformity; but they must always give rise to anxiety, and, in the graver degrees, they produce the most serious difficulties we have to contend with in the whole range of obstetrics.

Nature of Uterine Action in Pelvic Deformity.—In the lesser degrees, in which the proportion between the presenting part and the pelvis is only slightly altered, we may observe little abnormal beyond a greater intensity of the pains, and some protraction of the labor. It is generally observed that the uterine contractions are strong and forcible in cases of this kind, probably because of the increased resistance they have to contend against; and this is obviously a desirable and conservative occurrence, which may, of itself, suffice to overcome the difficulty. The first stage, however, is not infrequently prolonged, and the pains are ineffective, for the head does not readily engage in the brim, the uterus is more mobile than in ordinary labors, and it probably acts at a disadvantage.

Risk to the Mother.—In the more serious cases, the mother is subjected to many risks, directly proportionate to the amount of obstruction and the length of the labor. The long-continued and excessive uterine action, produced by the vain endeavors to push the child through the contracted pelvic canal, the more or less prolonged contusion and injury to which the maternal soft parts are necessarily subjected (not unfrequently ending in inflammation and sloughing with all its attendant dangers), and the direct injury which may be inflicted by the measures we are compelled to adopt for aiding delivery (such as the forceps, turning, craniotomy, or Cæsarean section), all tend to make the prognosis a matter of grave anxiety.

Risk to the Child.—Nor are the dangers less to the child; and a very large proportion of still-births will always be met with. The infantile mortality may be traced to a variety of causes, the most important being the protraction of the labor, and the continuous pressure to which the presenting part is subjected. For this reason, even in cases in which the contraction is so slight that the labor is terminated by the natural powers, it has been estimated that 1 out of every 5 children is still-born; and as the deformity increases in amount, so, of course, does the prognosis to the child become more unfavorable.

Frequent Occurrence of Prolapse of the Cord.—Prolapse of the umbilical cord is of very frequent occurrence in cases of pelvic deformity, the tendency to this accident being traceable to the fact of the head not entering and occupying the upper strait of the pelvis as in ordinary labors, and thus leaving a space through which the cord may descend. So frequently is this complication met with in pelvic deformity that Stanesco† found it had happened as often as 59 times in 414 labors; and when the dangers of prolapsed funis are added to those of protracted labors, it is hardly a matter of surprise that the occurrence should, under such circumstances, almost always prove fatal to the child.

Injury to Child's Head.—The head of the child is also liable to injury of a more or less grave character from the compression to which it is subjected, especially by the promontory of the sacrum. Independently of the transient effects of undue pressure (temporary alteration of the shape of the bones and bruising of the scalp), there is often met with a more serious depression of the bones of the skull, produced by the sacral promontory. This is most marked in cases in which the head has been forcibly dragged past the projecting bone by the forceps, or after turning. The amount of depression varies with the degree of contraction; but sometimes, were it not for the yielding of the bones of the fœtal skull in this way, delivery, without lessening the size of the head by perforation, would be impossible. Such depressions are found at the spot immediately opposite the promontory, generally at the side of the skull near the junction of the frontal and parietal bones. Sometimes there is a slight permanent mark, but more often the depression disappears in a few days. The prognosis to the child is, however, grave, when the contraction has been sufficient to indent the skull; for it has been found that 50 per cent. of the children thus marked died either immediately or shortly after labor.*

Course of Labor.—The means which nature takes to overcome these difficulties are well worthy of study, and there are certain peculiarities in the mechanism of delivery when pelvic deformities exist, which it is of importance to understand, as they guide us in determining the proper treatment to adopt.

Frequency of Malpresentation.—Malpresentations of the fœtus are of much more frequent occurrence than in ordinary labors; partly because the head does not engage readily in the brim, but, remaining free above it, is apt to be pushed away by the uterine contractions, and partly because of the frequent alteration of the axis of the uterine tumor. The pendulous condition of the abdomen in cases of pelvic deformity is often very obvious, so that the fundus is sometimes almost in a line with the cervix, and thus transverse or other abnormal positions are very frequently met with. It is to be noted, however, that we cannot regard breech presentations as so unfavorable as in ordinary labors, for the pressure from the contracted pelvis is less likely to be injurious when applied to the body than to the head of the child; and indeed, as we shall presently see, the artificial production of these presentations is often advisable as a matter of choice.

Mechanism of Delivery in Head Presentations.—The mode in which the head passes naturally through a contracted pelvis is in some respects different from the ordinary mechanism of delivery in head presentations, and has been carefully worked out by Spiegelberg and other German obstetricians.

The means which nature adopts to overcome the difficulty are different in cases in which there is a marked narrowing of the conjugate diameter of the brim, and in those in which there is a generally contracted pelvis.

In Contracted Brim.—In the former, and more common deformity, when the head enters the brim, in consequence of the resistance it meets with, the expelling power of the uterus acts more on the anterior part of the head than in ordinary cases, the chin becomes in some degree separated from the sternum, and the anterior fontanelle descends somewhat lower than the posterior. At this stage, on examination, it will be found—supposing we have to do with a case in which the occiput points to the left side of the pelvis—that the anterior fontanelle is lower than the posterior, and to the right, the bi-temporal diameter of the head is engaged in the conjugate diameter of the brim (as the smallest diameter of the skull, there is manifest advantage in this), the bi-parietal diameter and the largest portion of the head points to the left side. The sagittal suture will be felt running across in the transverse diameter of the brim, but nearer to the sacrum, the head being placed obliquely. As the head is forced down by the uterine contractions, the parietal bone, which is resting on the promontory, is pushed against it, so that the sagittal suture is forced more into the true transverse diameter of the pelvic brim, and approaches nearer to the pubis. The next step is the depression of the head, the occiput undergoing a sort of rotation on its transverse axis, so that it

* Obstetrical Journ., July, 1879. † Op. cit., p. 94.

* Schroeder, op. cit., p. 256.

reaches a plane below the brim. When this is accomplished, the rest of the head readily passes the obstruction. The forehead now meets with the resistance of the pelvic walls, the posterior fontanelle descends to a lower level, and, as the cavity of the pelvis in cases of antero-posterior contraction of the brim is generally of normal dimensions, the rest of the labor is terminated in the usual way.

In Generally Contracted Pelvis.—In the generally contracted pelvis the head enters the brim with the posterior fontanelle lowest, and it is after it has engaged in it that the resistance to its progress becomes manifest. The result is, therefore, an exaggeration of what is met with in ordinary cases. The resistance to the anterior or longer arm of the lever is greater than that to the occipital or shorter; and, therefore, the flexion of the head becomes very marked. The posterior fontanelle is consequently unusually depressed, and the anterior quite out of reach. So the head is forced down as a wedge, and its further progress must depend upon the amount of contraction. If this be not too great the anterior fontanelle eventually descends, and delivery is completed in the usual way. Should the contraction be too much to permit of this, the head becomes jammed in the pelvis, and diminution of its size may be essential.

In cases of deformity of the conjugate diameter, combined with general contraction of the pelvis, the mechanism partakes of the peculiarities of both these classes, to a greater or less extent, in proportion to the preponderance of one or other species of deformity.

Diagnosis.—It rarely happens that deformities of the pelvis, except of the gravest kind, are suspected before labor has actually commenced; and, therefore, we are not often called upon to give an opinion as to the condition of the pelvis before delivery. Should we be so, there are various circumstances which may aid us in arriving at a correct conclusion. Prominent among them is the history of the patient in childhood. If she is known to have suffered from rickets in early life, more especially if the disease has left evident traces in deformities of the limbs, or in a dwarfed and stunted growth, or in curvature of the spine, there will be strong presumptive evidence of pelvic deformity; a markedly pendulous state of the abdomen may also tend to confirm the suspicion. Nothing short of a careful examination of the pelvis itself will, however, clear up the point with certainty; and, even by this means, to estimate the precise degree of deformity with accuracy requires considerable skill and practice. The ingenuity of practitioners has been much exercised, it might perhaps be justly said wasted, in the invention of various more or less complicated pelvimeters for aiding us in obtaining the desired object. It is, however, pretty generally admitted by all accoucheurs, that the hand forms the best and most reliable instrument for this purpose, at any rate as regards the interior of the pelvis; although a pair of callipers, such as Baudelocque's well-known instrument, is essential for accurately determining the external measurements. The objections to all internal pelvimeters, even those most simple in their construction, are their cost and complexity, and the impossibility of using them without pain or injury to the patient.

External Measurements.—It was formerly thought that by measuring the distance between the spinous processes of the sacrum and the symphysis pubis, and subtracting from it what we judge to be the thickness of the bones and soft parts, we might arrive at an approximate estimate of the measurement of the conjugate diameter of the pelvic brim. It is now admitted that this method can never be depended on, and that, taken by itself, it is practically useless. A change in the relative length of other external measurements of the pelvis is, however, often of great value in showing the existence of deformity internally, although not in judging of its amount. The measurements which are used for this purpose are between the anterior superior spines of the ilia, and between the centres of their crests, averaging respectively 10 and 11 inches. According to Spiegelberg these measurements may give one of three results.

1. Both may be less than they ought to be, but the relation of the one to the other remains unchanged.

2. That between the crests is not, or is at most very little, diminished, but that between the spines is increased.

3. Both are diminished, but at the same time their mutual relation is not normal, the distance between the spines being as long, if not longer, than that between the crests.

No. 1 denotes a uniformly contracted pelvis. No. 2, a pelvis simply contracted in the conjugate diameter of the brim, and not otherwise deformed. No. 3, a pelvis with narrowed conjugate and also uniformly contracted, as in the severe type of rachitic deformity. If, however, both these measurements are of average length, and the distance between the crests is about one inch greater than between the spines, the pelvis is normal.

Besides the above some information may be obtained by the measurement of the external conjugate diameter, which averages 7¾ inches. This may be taken by placing one point of the callipers in the depression below the spine of the last lumbar vertebra, the other at the centre of the upper edge of the symphysis pubis. If the measurement be distinctly below the average, not more, for example, than 6.3 in., we may conclude that there is a narrowing of the anterior-posterior diameter of the brim, the extent of which we must endeavor to ascertain by other means.

For the purpose of making these measurements Baudelocque's *compas d'épaisseur* can be used, or Dr. Lazarewitch's elegant universal pelvimeter, which can be adopted also for internal pelvimetry; but, in the absence of these special contrivances, an ordinary pair of callipers, such as are used by carpenters, can be made to answer the desired object.

Internal Measurements.—These external measurements must be corroborated by internal, chiefly of the antero-posterior diameter, by which alone we can estimate the amount of the deformity. We endeavor to find, in the first place, the length of the diagonal conjugate, between the lower edge of the symphysis pubis and the promontory of the sacrum, which averages about half an inch more than the true conjugate. This is best done by placing the patient on her back, with the hips well raised. The index and middle finger of the right hand are then introduced into the vagina, and the perineum is pressed steadily backwards, so as to overcome the resistance it offers. If the tip of the second finger can reach the promontory of the sacrum, the radial side of the first finger is raised so as to touch the lower edge of the pubis. A mark is made with the nail of the index of the left hand on that part of the examining finger which rests under the symphysis, and then the distance from this to the tip of the finger, less half an inch, may be taken to indicate the measurement of the true conjugate of the brim. Various pelvimeters are meant to make the same measurements, such as Lumley Earle's, Lazarewitch's, which is similar in principle, and Van Huevel's; the best and simplest, I think, is that invented by Dr. Greenhalgh (Fig. 91). It consists of a movable rod, attached to a flexible band of metal which passes around the palm of the examining hand. At the distal end of the rod is a curved portion, which passes over the radial edge of the index finger. The examination is made in the usual way, and when the point of the finger is resting on the promontory of the sacrum, the rod is withdrawn until it is arrested by the posterior surface of the symphysis, the exact measurement of the diagonal conjugate being then read off on the scale.

It is to be remembered that this procedure is useless in the slighter degrees of contraction, on which the promontory of the sacrum cannot be easily reached. Dr. Ramsbotham proposed to measure the conjugate by spreading out the index and middle fingers internally, the tip of one resting on the promontory, the other behind the symphysis pubis; and then drawing them, in the same position, and measuring the distance between them. This manœuvre I believe to be impracticable.

Whenever, in actual labor, we wish to ascertain the condition of the pelvis accurately, the patient should be anæsthetized, and the whole hand introduced into the vagina (which could not

otherwise be done without causing great pain), and the proportions of the pelvis, and the relations of the head to it, thoroughly explored; and, if what has been said as to the mechanism of delivery in these cases be borne in mind, this may aid us in determining the kind of deformity existing. In this way contractions about the outlet of the pelvis can also be pretty generally made out.

Mode of Diagnosing the Oblique Pelvis.—The obliquely contracted pelvis cannot be determined by any of these methods, but certain external measurements, as Naegele has pointed out, will readily enable us to recognize its existence. It will be found that measurements, which in the healthy pelvis ought to be equal, are

Fig. 91.

Greenhalgh's Pelvimeter.

unequal in the obliquely distorted pelvis. The points of measurement are chiefly: 1. From the tuberosity of the ischium on one side to the posterior superior spine of the ilium on the other; 2. From the anterior superior iliac spine on the one side to the posterior superior on the opposite; 3. From the trochanter major of one side to the posterior superior iliac spine on the other; 4. From the lower edge of the symphysis pubis to the posterior superior iliac spine; 5. From the spinous process of the last lumbar vertebra to the anterior superior spine of the ilium on either side.

If these measurements differ from each other by half an inch to an inch, the existence of an oblique deformed pelvis may be safely diagnosed. The diagnosis can be corroborated by placing the patient in the erect position, and letting fall two plumb lines, one from the spines of the sacrum, the other from the symphysis pubis. In a healthy pelvis these will fall in the same plane, but in the oblique pelvis the anterior line will deviate considerably towards the unaffected side.

Treatment.—The proper management of labor in contracted pelvis is, even up to this time, one of the most vexed questions in midwifery, notwithstanding the immense amount of discussion to which it has given rise; and the varying opinions of accoucheurs of equal experience afford a strong proof of the difficulties surrounding the subject. This remark applies, of course, only to the lesser degrees of deformity, in which the birth of a living child is not hopeless. When the antero-posterior diameter of the brim measures from 2¾ to 3 inches, it is universally admitted that the destruction of the child is inevitable, unless the pelvis be so small as to necessitate the performance of the Cæsarean section. But when it is between 3 inches and the normal measurement, the comparative merits of the forceps, turning and the induction of premature labor, form a fruitful theme for discussion. With one class of accoucheurs the forceps is chiefly advocated, and turning admitted as an occasional resource when it has failed; and this indeed, speaking broadly, may be said to have been the general view held in this country. More recently we find German authorities of eminence, such as Schroeder and Spiegelberg, giving turning the chief place, and condemning the forceps altogether in contracted pelvis, or, at least, restricting its use within very narrow limits. More strangely still we find, of late, that the induction of premature labor, on the origination and extension of which British accoucheurs have always prided themselves, is placed without the pale, and spoken of as injurious and useless in reference to pelvic deformities. To see our way clearly amongst so many conflicting opinions is by no means an easy task, and perhaps we may best aid in its accomplishment by considering separately the three operations in so far as they bear on this subject, and pointing out briefly what can be said for and against each of them.

The Forceps.—In England and in France it is pretty generally admitted that in the slighter degrees of contraction the most reliable means of aiding the patient is by the forceps. It should be remembered that the operation, under such circumstances, is always much more serious than in ordinary labors simply delayed from uterine inertia, when there is ample room, and the head is in the cavity of the pelvis; for the blades have to be passed up very high, often when the head is more or less movable above the brim, and much more traction is likely to be required. For these reasons artificial assistance, when pelvic deformity is suspected, is not to be lightly or hurriedly resorted to. Nor, fortunately, is it always necessary; for if the pains be sufficiently strong, and the contraction not too great to prevent the head engaging at all, after a lapse of time it will become so moulded in the brim as to pass even a considerable obstruction. In all cases, therefore, sufficient time must be given for this; and if no suspicious symptoms exist on the part of the mother—no elevation of temperature, dryness of the vagina, rapid pulse, and the like, and the fœtal heart-sounds continue to be normal—labor may be allowed to go on for some hours after the rupture of the membranes, so as to give nature a chance of completing the delivery. When this seems hopeless, the intervention of art is called for.

Cases Suitable for the Forceps.—The forceps is generally considered to be applicable in all degrees of contraction, from the standard measurement, down to about 3¼ inches in the conjugate of the brim. There can be no doubt that, in such cases, traction with the forceps often enables us to effect delivery, when the natural efforts have proved insufficient, and holds out a very fair hope of saving the child. Out of 17 cases in which the high forceps operation was resorted to for pelvic deformity, reported by Stanesco, in 13 living children were born. If the length of the labor, and the long-continued compression to which the child has been subjected, be borne in mind, this result must be considered very favorable.

Objections that have been Raised to the Forceps.—What are the objections which have been brought against the operation? These have been principally made by Schroeder and other German writers. They are, chiefly the difficulty of passing the instrument; the risk of injuring the maternal structures; and the supposition that, as the blades must seize the head by the forehead and occiput, their compressive action will diminish its longitudinal and increase its transverse diameter (which is opposed to the contracted part of the brim), and so enlarge the head just where it ought to be smallest. There is little doubt that these writers much exaggerate the compressive power of the forceps. Certainly with those generally used in this country, any disadvantage likely to accrue from this is more than counterbalanced by the traction on the head; and the fact, that minor degrees of obstruction can be thus overcome, with safety both to the mother and child, is abundantly proved by the numberless cases in which the forceps have been used.

It is not Equally Suitable in all Kinds of Deformity.—It is very likely that the forceps do not act equally well in all cases. When the head is loose above the brim; when the contraction is chiefly limited to the antero-posterior diameter, and there is abundance of room at the sides of the pelvis for the occiput to occupy after version; and when, as is usual in these cases, the anterior fontanelle is

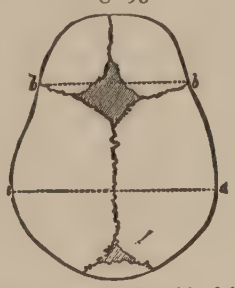
depressed and the head lies transversely across the brim, it is probable that turning may be the safer operation for the mother, and the easier performed. When, on the other hand, the head has engaged in the brim, and has become more or less impacted, it is obvious that version could not be performed without pushing it back, which may neither be easy nor safe. In the generally contracted pelvis, in which the head enters in an exaggerated state of flexion and lies obliquely, the posterior fontanelle being much depressed, the forceps are more suitable.

Mechanical Advantage of Turning in Certain Cases.—The special reasons why version sometimes succeeds when the forceps fails, or why it may be elected from the first as a matter of choice, have been by no one better pointed out than by Sir James Simpson. Although the operation was performed by many of the older obstetricians, its revival in modern times, and the clear enunciation of its principles, can undoubtedly be traced to his writings. He points out that the head of the child is shaped like a cone, its narrowest portion the base of the cranium (Fig. 92, *bb*), measuring,

Fig. 92.

Section of Fœtal Cranium, showing its Conical Form.

Fig. 93.



Showing the greater Breadth of the Bi-parietal Diameter of the Fœtal Cranium. (After Simpson.)

on an average, from ½ to ⅔ of an inch less than the broadest portion (Fig. 92, *aa*), viz., the bi-parietal diameter. In ordinary head presentations the latter part of the head has to pass first; but if the feet are brought down, the narrow apex of the cranial cone is brought first into apposition with the contracted brim, and can be no more easily *drawn* through than the broader base can be *pushed* through by the uterine contractions. Nor is this the only advantage, for after turning the narrower bi-temporal diameter (Fig. 93, *bb*)—which measures, on an average, half an inch less than the bi-parietal (Fig. 93, *aa*)—is brought into contact with the contracted conjugate, while the broader bi-parietal lies in the comparatively wide space at the side of the pelvis (Fig. 94). These

Fig. 94.

Showing the greater Space for the Bi-parietal Diameter at the Side of the Pelvis in certain Cases of Deformity. (After Simpson.)

mechanical considerations are sufficiently obvious, and fully explain the success which has often attended the performance of the operation.

Limits of the Operation.—It is generally admitted that it may be possible, for the reasons just mentioned, to deliver a living child by turning, through a pelvis contracted beyond the point which would permit of a living child being extracted by the forceps. Many obstetricians believe that it is possible to deliver a living child by turning in a pelvis contracted even to the extent of 2¾ inches in the conjugate diameter. Barnes maintains that, although an unusually compressible head may be drawn through a pelvis contracted to 3 inches, the chance of the child being born alive under such circumstances must necessarily be small, and that from 3¼ inches to the normal size must be taken as the proper limits of the operation.

That delivery is often possible by turning, after the forceps and the natural powers have failed, and when no other resource is left but the destruction of the child, must, I think, be admitted by all; for the records of obstetrics are full of such cases. To take one example only, Dr. Braxton Hicks* records four cases in which the forceps were tried unsuccessfully, in all of which version was used, three of the children being born alive. Here are the lives of three children rescued from destruction, within a short period, in the practice of one man; and a fact like this would, of itself, be ample justification of the attempt to deliver by turning, when the child was known to be alive, and other means had failed. The possibility that craniotomy may still be required is no argument against the operation; for although perforation of the after-coming head is certainly not so easy as perforation of a presenting head, it is not so much more difficult as to justify the neglect of an experiment by which it may possibly be altogether avoided.

Comparative Estimate of the Two Operations.—The original choice of turning is a more difficult question to decide. My own impression is that the use of the forceps will generally be found to be preferable. An exception should, I think, be made for those cases in which the head refuses to enter the brim, and cannot be sufficiently steadied by external pressure to admit of an easy application of the instrument. Under these circumstances increasing experience leads me to prefer turning as decidedly the simpler and safer operation, and the passage of the head through the contracted brim can be very materially facilitated by strong pressure from above, as has been so well pointed out by Goodell.†

An argument used by Martin, of Berlin,‡ in reference to the two operations, should not be lost sight of, as it seems to be a valid reason for giving a preference to the forceps. He points out that moulding may safely be applied for hours to the vertex; but that when pressure is applied to the important structures about the base of the brain, as after turning, moulding cannot be continued beyond five minutes without proving fatal. This, however, is no reason why turning should not be used after the forceps and the natural efforts have proved ineffectual.

Craniotomy or the Cæsarean Section is Required.—When the contraction is below 3 inches in the conjugate, or when the forceps and turning have failed, no resource is left but the destruction of the fœtus, or the Cæsarean section.

The induction of premature labor as a means of avoiding the risks of delivery at term, and of possibly saving the life of the child, must now be studied. The established rule, in this country, is, that in all cases of pelvic deformity, the existence of which has been ascertained either by the experience of former labors, or by accurate examination of the pelvis, labor should be induced previous to the full period so that the smaller and more compressible head of the premature fœtus may pass, where that of the fœtus at term could not. The gain is a double one, partly the lessened risk to the mother, and partly the chance of saving the child's life.

The practice is so thoroughly recognized as a conservative and judicious one, that it might be deemed unnecessary to argue in its favor, were it not that some most eminent authorities have of late years tried to show, that it is better and safer to the mother to leave the labor to come on at term; and that the risk to the child is so great in artificially induced labor as to lead to the conclusion that the operation should be altogether abandoned, except, perhaps, in the extreme distortion in which the Cæsarean section might otherwise be necessary. Prominent amongst those who hold these views are Spiegelberg and Litzmann, and they have been

* Guy's Hosp. Rep., 1870. † Amer. Journ. of Obst., vol. viii.
‡ Mon. f. Geburt., 1867.

supported, in a modified form, by Matthews Duncan. Spiegelberg* tries to show, by a collection of cases from various sources, that the results of induced labor in contracted pelvis are much more unfavorable than when the cases are left to nature; that in the latter the mortality of the mothers is 6.6 per cent., and of the children 28.7 per cent., whereas in the former the maternal deaths are 15 per cent., and the infantile 66.9 per cent. Litzmann† arrives at not very dissimilar results, namely, 6.9 per cent. of the mothers and 20.3 per cent. of the children in contracted pelvis at term, and 14.7 per cent. of the mothers and 55.8 per cent. of the children, in artificially induced premature labor.

If these statistics were reliable, inasmuch as they show a very decided risk to the mother, there might be great force in the argument that it would be better to leave the cases to run the chance of delivery at term. It is, however, very questionable whether they can be taken, in themselves, as being sufficient to settle the question. The fallacy of determining such points by a mass of heterogeneous cases, collected together without a careful sifting of their histories, has over and over again been pointed out; and it would be easy enough to meet them by an equal catalogue of cases in which the maternal mortality is almost nil. The results of the practice of many authorities are given in Churchill's work, where we find, for example, that out of 46 cases of Merriman's, not one proved fatal. The same fortunate result happened in 62 cases of Rambotham's. His conclusion is, that "there is undoubtedly some risk incurred by the mother, but not more than by accidental premature labor," and this conclusion, as regards the mother, is that which has long ago been arrived at by the majority of British obstetricians, who undoubtedly have more experience of the operation than those of any other nation. With regard to the child, even if the German statistics be taken as reliable, they would hardly be accepted as contra-indicating the operation, inasmuch as it is intended to save the mother from the dangers of the more serious labor at term, and, in many cases, to give at least a chance to the child, whose life would otherwise be certainly sacrificed. The result, moreover, must depend to a great extent on the method of operation adopted, for many of the plans of inducing labor recommended are certainly, in themselves, not devoid of danger both to the mother and the child. It may, I think, be admitted, as Duncan contends,‡ that the operation has been more often performed than is absolutely necessary, and that the higher degrees of pelvic contraction are much more uncommon than has been supposed to be the case. That is a very valid reason for insisting on a careful and accurate diagnosis, but not for rejecting an operation which has so long been an established and favorite resource.

Determination of Period for Inducing Labor.—When the induction of labor has been determined on, the precise period at which it should be resorted to becomes a question for anxious consideration, for the longer it is delayed the greater, of course, are the dangers for the child. Many tables have been constructed to guide us on this point, which are not, on the whole, of so much service as they might appear to be, on account of the difficulty of determining with minute accuracy the amount of contraction. The following, however, which is drawn up by Kiwisch, may serve for a guide in settling this question:—

	Inches.	Lines.			
When the sacro-pubic diameter is	2 and	6 or 7	induce labor at	30th	week.
" "	2 "	8 " 9	" "	31st	"
" "	2 "	10 " 11	" "	32d	"
" "	3 "	—	" "	33d	"
" "	3 "	1	" "	33d	"
" "	3 "	2 " 3	" "	34th	"
" "	3 "	4 " 5	" "	35th	"
" "	3 "	5 " 6	" "	36th	"

In cases of moderate deformity, when labor pains have been induced, the further progress of the case may be left to nature; but in the more marked cases, as in those below 3 inches, it will often be found necessary to assist delivery by turning or by the forceps, the former being here specially useful, on account of the extreme pliability of the head, and the facility with which it may be drawn through the contracted brim. By thus combining the two operations it may be quite possible to secure the birth of a living child even in pelves very considerably deformed.

Production of Abortion in Extreme Deformity.—When the contraction is so great as to necessitate the induction of the labor before the sixth month, or, in other words, before the child has reached a viable age, it would be preferable to resort to a very early production of abortion. The operation is then indicated, not for the sake of the child, but to save the mother from the deadly risk to which she would otherwise be subjected. As in these cases, the mother alone is concerned, the operation should be performed as soon as we have positively determined the existence of pregnancy. No object can be gained by waiting until the development of the child is advanced to any extent, and the less the fœtus is developed, the less will be the pain and risks the mother has to undergo. There is no amount of deformity, however great, in which we could not succeed in bringing on miscarriage by some of the numerous means at our disposal; and, in spite of Dr. Radford's objections, who maintains that the obstetrician is not justified in sacrificing the life of a human being more than once, when the mother knows that she cannot give birth to a viable child, there are few practitioners who would not deem it their duty to spare the mother the terrible dangers of the Cæsarean section.

SECTION XIII.

HEMORRHAGE BEFORE DELIVERY: PLACENTA PRÆVIA.

The hemorrhages which are the result of an abnormal situation of the placenta, partially or entirely, over the internal os uteri, have formed a most fruitful theme for discussion. The causes producing the abnormal placental site, the sources of the blood, and the causes of its escape, the means adopted by nature for its arrest, and the proper treatment, have, each and all of them, been the subject of endless controversies, which are not yet by any means settled. It must be admitted, too, that the extreme importance of the subject amply justifies the attention which has been paid to it; for there is no obstetric complication more apt to produce sudden and alarming effects, and none requiring more prompt and scientific treatment.

By *placenta prævia* we mean the insertion of the placenta at the lower segment of the uterine cavity, so that part of it is situated, wholly or partially, over the internal os uteri. In the former case there is *complete* or *central* placental presentation, in the latter an *incomplete* or *marginal* presentation.

Causes.—The causes of this abnormal placental site are not fully understood. It was supposed by Tyler Smith to depend on the ovule not having been impregnated until it had reached the lower part of the uterine cavity. Cazeaux suggests that the uterine mucous membrane is less swollen and turgid than when impregnation occurs at the more ordinary place, and that, therefore, it offers less obstruction to the descent of the ovule to the lower part of the uterine cavity. An abnormal size, or unusual shape, of the uterine cavity may also favor the descent of the impregnated ovule; the former probably explains the fact, that placenta prævia more generally occurs in women who have borne several children. These are merely interesting speculations having no practical value, the fact being undoubted that, in a not inconsiderable number of cases—estimated by Johnson and Sinclair as 1 out of 573—the placenta is grafted partially or entirely over the uterine orifice.

History.—Placenta prævia was not unknown to the older writers, who believed that the placenta had originally been situated at the fundus, from which it had accidentally fallen to the lower part of the uterus. Portal, Levret, Roederer, and especially our own countryman Rigby, were among those whose observations tended

* Arch. f. Gyn., b. i. s. 1. † Ib., b. ii. s. 169.
‡ Edin. Med. Journ., July, 1873, p. 339.

to improve the state of obstetrical knowledge as to its real nature. To Rigby we owe the term "*unavoidable hemorrhage*," as a synonym for placenta prævia, and as distinguishing hemorrhage from this source from that resulting from separation of the placenta at its more usual position, termed by him, in contra-distinction, "*accidental hemorrhage*." These names, adopted by most writers on the subject, are obviously misleading, as they assume an essential distinction in the etiology of the hemorrhage in the two classes of cases, which is not always warranted.

It is of the utmost importance to a right understanding of the nature and treatment of placenta prævia that we should fully understand the source of the hemorrhage, and the manner of its production; but we shall be able to discuss this subject better after a description of the symptoms.

Symptoms.—Although the placenta must occupy its unusual site from the earliest period of its formation, it rarely gives rise to appreciable symptoms before the last three months of utero-gestation. It is far from unlikely, however, that such an abnormal situation of the placenta may produce abortion in the earlier months, the site of its attachment passing unobserved.

Sudden Flow of Blood.—The earliest symptom which causes suspicion is the sudden occurrence of hemorrhage, without any appreciable cause. The amount of blood lost varies considerably. In some cases the first hemorrhage is comparatively slight, and is soon spontaneously arrested; but, if the case be left to itself, the flow after a lapse of time—it may be a few days, or it may be weeks—again commences in the same unexpected way, and each successive hemorrhage is more profuse. The losses show themselves at different periods. They rarely begin before the end of the sixth month, more often nearer the full period, and sometimes not until labor has actually commenced. The hemorrhage very often coincides with what would have been a menstrual period; doubtless on account of the physiological congestion of the uterine organs then present. Should the first loss not show itself until at or near the full time, it may be tremendous, and a few moments may suffice to place the patient's life in jeopardy. Indeed it may be safely accepted as an axiom, that once hemorrhage has occurred, the patient is never safe; for excessive losses may occur at any moment without warning, and when assistance is not at hand. It often happens that premature labor comes on after one or more hemorrhages.

In any case of placenta prævia, when labor has commenced, whether premature or at the full time, the hemorrhage may become excessive, and with each pain fresh portions of the placenta may be detached, and fresh vessels torn and left open. Under these circumstances the blood often escapes in greater quantity with each successive pain, and diminishes in the intervals. This has long been looked upon as a diagnostic mark by which we can distinguish between the so-called "unavoidable" and "accidental" hemorrhage; in the latter the flow being arrested during the pains. The distinction, however, is altogether fallacious. The tendency of uterine contraction in placenta prævia, as in all other forms of uterine hemorrhage, is to constrict the vessels from which the blood escapes, and so to lessen the flow. The apparently increased flow during the pains depends on the pains forcing out blood which has already escaped from the vessels. In one way up to a certain point, the pains do favor hemorrhage, by detaching fresh portions of placenta; but the actual loss takes place chiefly during the intervals, and not during the continuance of contraction.

Results of Vaginal Examination.—On vaginal examination, if the os be sufficiently open to admit the finger, which it generally is on account of the relaxation produced by the loss of blood, we shall almost always be able to feel some portion of presenting placenta. If it be a central implantation, we shall find the upper aperture of the cervix entirely covered by a thick, boggy mass, which is to be distinguished from a coagulum by its consistence, and by its not breaking down under the pressure of the finger. Through the placental mass we may feel the presenting part of the fœtus; but not as distinctly as when there is no intervening substance. In partial placental presentations the bag of membranes, and above it the head or other presentation, will be found to occupy a part of the circle of the os, the rest being covered by the edge of the placenta. In marginal presentations we may only be able to make out the thickened edge of the after-birth, projecting at the rim of the os. If the cervix be high, and the gestation not advanced to term, these points may not be easy to make out, on account of the difficulty of reaching the cervix; and, as accurate diagnosis is of the utmost importance, it is proper to introduce two fingers, or even the whole hand, so as thoroughly to explore the condition of the parts. The lower portion of the uterine ovoid may be observed to be more than usually thick and fleshy; and Gendrin has pointed out that ballottment cannot be made out. The accuracy of our diagnosis may be confirmed, in doubtful cases, by finding that the placental bruit is heard over the lower part of the uterine tumor.

Dr. Wallace* has suggested that vaginal auscultation may be serviceable in diagnosis, and states that, by means of a curved wooden stethoscope, the placental bruit may be heard with startling distinctness. This is, however, a manœuvre that can hardly be generally carried out in actual practice.

The Source of Hemorrhage.—It is now generally admitted by authorities that the immediate source of the hemorrhage is the lacerated utero-placental vessels. Only a few years ago Sir James Simpson advocated with his usual energy the theory sustained by his predecessor, Dr. Hamilton, that the chief, if not the only, source of hemorrhage was the detached portion of the placenta itself. He argued that the blood flowed from the portion of the placenta which was still adherent into that which was separated, and escaped from the surface of the latter; and on this supposition he based his practice of entirely separating the placenta, having observed that, in many cases in which the after-birth had been expelled before the child, the hemorrhage had ceased. The fact of the cessation of the hemorrhage, when this occurs, is not doubted; but Simpson's explanation is contested by most modern writers, prominent among whom is Barnes, who has devoted much study to the elucidation of the subject. He points out that the stoppage of the hemorrhage is not due to the separation of the placenta, but to the preceding or accompanying contraction of the uterus, which seals up the bleeding vessels, just as it does in other forms of hemorrhage. The site of the loss was actually demonstrated by the late Dr. Mackenzie in a series of experiments, in which he partially detached the placenta in pregnant bitches, and found that the blood flowed from the walls of the uterus, and not from the detached surface of the placenta. The arrangement of the large venous sinuses, opening as they do on the uterine mucous membrane, favors the escape of blood when they are torn across; and it is from them, possibly to some extent also from the uterine arteries, that the blood comes, just as in post-partum hemorrhage, when the whole, instead of a part, of the placental side is bared.

Causes of Hemorrhage.—Various explanations have been given of the causes of the hemorrhage. For long it was supposed to depend on the gradual expansion of the cervix during the latter months of pregnancy, which separated the abnormally placed placenta. It has been seen, however, that this shortening of the cervix is apparent only, and that the cervical canal is not taken up into the uterine cavity during gestation, or, at all events, only during the last week or so. This, therefore, cannot be admitted as an explanation of placental separation. Jacquemier proposed another theory which has been adopted by Cazeaux. He maintains that during the first six months of utero-gestation the superior portion of the uterus is more especially developed, as shown by the pyriform shape of the fundus during the time; and that, as the placenta is usually attached in that situation, and then attains its maximum of development, its relations to its attachments are undisturbed. During the last three months of pregnancy, on the contrary, the

* Edin. Med. Journ., Nov., 1872.

lower segment of the uterus develops more than the upper, while the placenta remains nearly stationary in size; the inevitable result being a loss of proportion between the cervix and the placenta, and the detachment of the latter. There are various objections which can be brought against this theory; the most important being that there is no evidence at all to show that the lower segment of the uterus does expand more in proportion than the upper during the latter months of pregnancy. Barnes' theory is based on the supposition that the loss of relation between the uterus and placenta is caused by excess of growth on the part of the placenta itself over that of the cervix, which is not adapted for its attachment. The placenta, on this hypothesis, grows away from the site of its attachment, and hemorrhage results. It will be observed that neither this theory, nor that propounded by Jacquemier, are readily reconcilable with the fact that hemorrhage frequently does not begin until labor has commenced at term. Inasmuch as the loss of relation between the placenta and its attachments, which they both presuppose, must exist in every case of placenta prævia, hemorrhage should always occur during some part of the last three months of pregnancy. Matthews Duncan* has recently investigated the whole subject at length, and maintains that the hemorrhages are accidental, not unavoidable, being due to precisely similar causes as those which give rise to the occasional hemorrhages when the placenta is normally placed. The abnormal situation of the placenta, of course, renders these causes more apt to operate; but in their action he believes them to be precisely similar to those of accidental hemorrhage, properly so called. Separation of the placenta from expansion of the cervix, he believes to be the cause of hemorrhage after labor has begun, and then it may strictly be called unavoidable: but hemorrhage is comparatively seldom so produced during the continuance of pregnancy. "There are," says Duncan, "four ways in which this kind of hemorrhage may occur:—

"1. By the rupture of a utero-placental vessel at or about the internal os uteri.

"2. By the rupture of a marginal utero-placental sinus within the area of spontaneous premature detachment, when the placenta is inserted not centrally or covering the internal os, but with a margin at or near the central os.

"3. By partial separation of the placenta from accidental causes, such as a jerk or fall.

"4. By a partial separation of the placenta, the consequence of uterine pains producing a small amount of dilatation of the internal os. Such cases may be otherwise described as instances of miscarriage commencing, but arrested at a very early stage."

I see no reason to doubt the possibility of hemorrhage being due, in many cases, to the first three causes, and in its production it would strictly resemble accidental hemorrhage. The fourth heading refers the hemorrhage to partial separation, in consequence of commencing dilatation of the cervix, but it explains the dilatation by the supposition of commencing miscarriage. This latter hypothesis seems to be as needless as those which presuppose a want of relation between the placenta and its attachments. We know that, quite independently of commencing miscarriage, uterine contractions are constantly occurring during the continuance of pregnancy. There is reason to suppose that these contractions do not affect the cervical, as well as the fundal portions of the uterus; and in cases in which the placenta is situated partially or entirely over the os, one or more stronger contractions than usual may, at any moment, produce laceration of the placental attachments in that neighborhood.

Pathological Changes in the Placenta.—A careful examination of the placenta may show pathological changes at the site of separation, such as have been described by Gendrin, Simpson, and other writers. They probably consist of thrombosis in the placental cotyledons, and effused blood-clots, variously altered and discolorized, according to the lapse of time since separation took place. Changes occur in the portion of the placenta overlying the os uteri, whether separation has occurred or not. There may be atrophy of the placental structure in this situation, as well as changes of form, such as complete or partial separation into two lobes, the junction of which overlies the os uteri.*

Natural Termination when Placenta Presents.—The history of delivery, if left to nature, is specially worthy of study, as guiding to proper rules of treatment. It sometimes happens, when the pains are very strong and the delivery rapid, that labor is completed without any hemorrhage of consequence. "Although," says Cazeaux, "hemorrhage is usually considered to be inevitable under such circumstances, yet it may not appear even during the labor; and the dilatation of the os uteri may be effected without the loss of a drop of blood." Again, Simpson conclusively showed, that when the placenta was expelled before the birth of the child, all hemorrhage ceased.

Barnes' theory of placenta prævia, which has been pretty generally adopted, explains satisfactorily both these classes of cases.

He describes the uterine cavity as divisible into three zones or regions. When the placenta is situated in the upper or middle of these zones, no separation or hemorrhage need occur during labor. When, however, it is situated partially or entirely in the lower or cervical zone, the expansion of the cervix during labor must produce more or less separation, and consequent loss of blood. As soon as the previous portion of the placenta is sufficiently separated, provided contraction of the uterine tissue be present to seal up the mouths of the vessels, hemorrhage no longer takes place. The placenta may not be entirely detached, but no further hemorrhage occurs, in consequence of the remaining portion being engrafted on the uterus beyond the region of unsafe attachment.

In the former, then, of these classes of cases, the absence of hemorrhage is explained on this theory, by the pains being sufficiently rapid and strong to complete the separation of the placental attachment from the lower cervical zone before flooding had taken place; in the latter, it ceases, not necessarily because the entire placenta is expelled, but because of its detachment from the area of dangerous implantation.

The amount of cervical expansion required for this purpose varies in different cases. Dr. Duncan† estimates the limit of the spontaneous detaching area to be a circle of 4½ inches diameter, and that, after the cervix has expanded to that extent, no further separation or hemorrhage takes place. To admit of the passage of a full-sized head, Barnes estimates that expansion to about a circle of 6 inches diameter is necessary; on the other hand he has sometimes observed "that the hemorrhage has completely stopped when the os uteri had opened to the size of the rim of a wineglass, or even less."

It will be seen then that in this, as in every other form of puerperal hemorrhage, the tendency of uterine contraction is to check the hemorrhage; and that, provided the pains are sufficiently energetic, nature may be capable of stopping the flooding without artificial aid. It is but rarely, however, that she can be trusted for the purpose; and we shall presently see that these theoretical views have an important practical bearing on the subject of treatment.

Prognosis.—The prognosis to both the mother and child is certainly grave in all cases of placenta prævia. Read, in his treatise on placenta prævia, estimates the maternal mortality, from the statistics of a large number of cases, as 1 in 4½ cases, and Churchhill as 1 in 3. This is unquestionably too high an estimate and based on statistics the accuracy of which cannot be relied on. The mortality will, of course, greatly depend on the treatment adopted. Doubtless, if cases were left to nature, the result would be quite as unfavorable as Read supposes. But if properly managed, much more successful results may safely be anticipated. Out of 64 cases, recorded by Barnes, the deaths were 6, or 1 in 10½. Under any circumstances the risks to the mother are very great. Churchill estimates that more than half of the children are lost. The reasons for the great danger to the child are very obvious, subjected as it is

* Edin. Med. Journ., Nov. 1873, and Brit. Med. Journ., Nov. 1873.

* Sinelius, Arch. Gén. de Méd., vol. ii. 1861. † Obst. Trans., vol. xv.

to the risk of asphyxia from the loss of the maternal blood, and from its respiration being carried on during labor by a placenta which is only partially attached; many children also perish from prematurity, or from mal-presentation.

Treatment.—Whenever, in the latter months of pregnancy, a sudden hemorrhage occurs, the possibility of placenta prævia will naturally suggest itself; and, by a careful vaginal examination, which under such circumstances should always be insisted on, the existence of this complication will generally be readily ascertained. It is seldom that the os is not sufficiently dilated to enable us to satisfy ourselves when the placenta is presenting.

Is it Justifiable to allow the Pregnancy to Continue?—The first question that will arise is, are we justified in temporizing, using means to check the hemorrhage, and allowing the pregnancy to continue? This is the course which has generally been recommended in works on midwifery. We are told to place the patient on a hard mattress, not to heat or overburden her with clothes, to keep her absolutely at rest, to have the room cool and well-aired, to apply cold cloths to the vulva and lower part of the abdomen, to administer cold and acidulated drinks in abundance, and to prescribe acetate of lead and opium, or gallic acid, on account of their supposed hæmostatic effect. Of late years the judiciousness of these recommendations has been strongly contested. Not long ago an interesting discussion took place at the Obstetrical Society of London,* on a paper in which Dr. Greenhalgh advised the immediate induction of labor in all cases of placenta prævia. No less than six metropolitan teachers of midwifery took part in it, and, although they differed in details, they all agreed as to the inadvisability of allowing pregnancy to progress when the existence of placenta prævia had been distinctly ascertained. The reasons for this course are obvious and unanswerable. The labor, indeed, very often comes on of its own accord; but should it not do so, the patient's life must be considered to be always in jeopardy until the case is terminated, for no one can be sure that most dangerous, or even fatal flooding may not at any moment come on; and the nearer to term the patient is, the greater the risk to which she is subjected. Nor is the safety of the child likely to be increased by delay. Provided it has arrived at a viable age, the chances of its being born alive may be said to be greater if pregnancy be terminated at once, than if repeated floodings occur. I think, therefore, that it may be safely laid down as an axiom, that no attempt should be make to prevent the termination of pregnancy, but that our treatment should rather contemplate its conclusion as soon as possible. An exception may, however, be made to this rule when the hemorrhage occurs for the first time before the seventh month of utero-gestation. The chances of the child surviving would then be very small, and if the hemorrhage be not alarming, as at that early period is likely to be the case, the measures indicated above may be employed, in the hope of carrying on the pregnancy until there is a prospect of the patient being delivered of a living child. But little benefit is likely to accrue from astringent drugs. Perfect rest in bed is more likely to be beneficial than anything else; and astringent vaginal pessaries, of matico or perchloride of iron, might be used with advantage as local hæmostatics.

Various Methods of Treatment.—When the period of pregnancy, or the urgency of the case, determines us to forego any attempt at temporizing, there are various plans of treatment to be considered. These are chiefly—1. *Puncture of the membranes.* 2. *Plugging the vagina.* 3. *Turning.* 4. *Partial or complete separation of the placenta.* It will be well to consider in detail the relative advantages of, and indications for, each of these. It is seldom, however, that we can trust to any one *per se;* in most cases two or more are required to be used in combination.

1. *Puncture of the membranes* is recommended by Barnes as the first measure to be adopted in all cases of placenta prævia, sufficient to cause anxiety. "It is," he says, "the most generally efficacious remedy, and it can always be applied." The primary object gained is the increase of uterine contraction, by the evacuation of the liquor amnii. Although the first effect of this may be to increase the flow of blood by further separation of the placenta, the flooding can generally be commanded by plugging, until the os is sufficiently dilated to permit the passage of the child. As a rule, there is no great difficulty in effecting the puncture, especially if the placental presentation be only partial. A quill, or other suitable contrivance, guided by the examining finger, is passed through the cervix, and pushed through the membranes. In complete placenta prævia it may not be so easy to effect the evacuation of the liquor amnii; and, although many authorities advise the penetration of the substance of the placenta itself, I am inclined to think that it would be better to abandon the attempt, in such cases, and trust to other methods of treatment.

The objections which have been raised to puncture of the membranes are chiefly, that it interferes with the gradual dilatation of the os and renders the operation of turning much more difficult. The os is not, however, so regularly dilated by the bag of membranes in cases of placenta prævia, as it is in ordinary labors. Moreover, the cervical tissues are generally relaxed by the hemorrhage, and dilatation is easily effected. Should we desire to dilate the os, preparatory to turning, we can readily do so by means of Barnes' bags, which act, at the same time, as an efficient plug. The objections, therefore, are not so weighty as they might have been before these artificial dilators were used. I am inclined, for these reasons, to agree with the recommendation that puncture of the membranes should be resorted to in all cases of placenta prævia.

2. *Plugging of the vagina*, or, still better, of the cavity of the cervix itself, is especially serviceable in cases in which the os is not sufficiently dilated to admit of turning, or of separation of the placenta, and in which the hemorrhage still continues after the evacuation of the liquor amnii. By means of this contrivance the escape of blood is effectually controlled.

The best way of plugging is to introduce a sponge tent of sufficient size into the cervical canal, and to keep it *in situ* by a vaginal plug; the best material for the latter, and the method of introduction, are described under the head of abortion. The sponge tent not only controls the hemorrhage more effectually than any other means, but is, at the same time, effecting dilatation of the cervix. It cannot be left in many hours on account of the irritation produced, and, of the fetor from accumulating vaginal discharges. As long as it is in position, we should carefully examine, from time to time, to see that no blood is oozing past it. If preferred, a Barnes' bag may be used for the same purpose.

While the plug is *in situ*, other modes of exciting uterine action may be very advantageously employed, such as a firm, abdominal bandage, occasional friction over the uterus, and repeated doses of ergot. The last is specially recommended by Dr. Greenhalgh, who used, at the same time, a plug formed of an oblong India-rubber ball inflated with air, and covered with spongio-piline.

On the removal of the plug we may find that considerable dilatation has taken place, perhaps to a sufficient extent to admit of labor being safely concluded by the natural efforts. In that case we shall find that, although the pains continue, no fresh hemorrhage occurs. Should it do so, it will be necessary to adopt further measures.

3. *Turning* has long been considered *the* remedy *par excellence* in placenta prævia; and it is of unquestionable value in suitable cases. Much harm, however, has been done when it has been practised before the os was sufficiently dilated to admit of the passage of the hand, or when the patient was so exhausted by previous hemorrhage as to be unable to bear the shock of the operation. The records of many fatal cases in the practice of those who taught, as did the large majority of the older writers, that turning at all risks was essential, conclusively prove this assertion.

It is most likely to prove serviceable when, either at first, or after the use of the tampon, the os is sufficiently dilated to admit

*Obst. Trans., vol. vi. p. 188.

the hand, and when the strength of the patient is not much enfeebled. If she have a small, feeble, and thready pulse, it is certainly inapplicable, unless all other methods of arresting the hemorrhage have failed. And, even then, it would be well to attempt to rally the patient from her exhausted state by stimulants, etc., before the operation is commenced.

Provided the placental presentation be partial, the operation can be performed without difficulty in the usual way. In central implantation the passage of the hand may give rise to some difficulty. Dr. Rigby recommends that it should be pushed through the substance of the placenta, until it reaches the uterine cavity. It is hardly possible to conceive how this could be done without completely detaching the placenta, and still less to understand how the fœtus could be dragged through the aperture thus made. It will be far better to pass the hand by the border of the placenta, separating it as we do so; and, if we can ascertain to which side of the cervix it is least attached, that should be chosen for the purpose. In all cases in which it is possible, turning by the bi-polar method should be preferred. In cases of placenta prævia especially it offers many advantages. The operation can be soon performed; complete dilatation of the os is not so necessary; and it involves less bruising of the cervix, which is likely to be specially dangerous. When once a foot has been brought within the os, the delivery need not be hurried. The foot forms a plug, which effectually prevents all further loss; and we may then safely wait until we can excite uterine contraction, and terminate the labor with safety. Fortunately, the relaxation of the uterus, which is so often present, facilitates this manner of performing version, and it can generally be successfully accomplished. Should the case be one which is otherwise suitable for turning, and the requisite amount of dilatation of the cervix not be present, the latter can generally be effected in the space of an hour or more (while at the same time a further loss of blood is effectually prevented) by the use of Barnes' bags.

4. *Separation of the Placenta.*—Entire separation of the placenta was originally recommended by Simpson in his well-known paper on the subject. The reasons which induced him to recommend it have already been stated. It is a mistake to suppose, however, as is so often done, that he intended to recommend it in all cases alike. This supposition he always was careful to deny. He advised it especially:—

1. When the child is dead.
2. When the child is not yet viable.
3. When the hemorrhage is great and the os uteri is not yet sufficiently dilated for safe turning. This was the state in 11 out of 39 cases (Lee).
4. When the pelvic passages are too small for safe and easy turning.
5. When the mother is too exhausted to bear turning.
6. When the evacuation of the liquor amnii fails.
7. When the uterus is too firmly contracted for turning.*

These are very much the cases in which all modern accoucheurs would exclude the operation of turning; and it was especially when that was unsuitable that Simpson advised extraction of the placenta. As his theory of the source of hemorrhage is now almost universally disbelieved, so has the practice based on it fallen into disuse, and it need not be discussed at length. It is very doubtful whether the complete separation and extraction of the placenta was a feasible operation; unquestionably it can be by no means so easy as Simpson's writings would lead us to suppose. The introduction of the hand far enough to remove the placenta in an exhausted patient would probably cause as much shock as the operation of turning itself; and another very formidable objection to the procedure is the almost certain death of the child, if any time elapse between the separation of the placenta and the completion of delivery. The modification of this method, so strongly advocated by Barnes, is certainly much easier of application, and would appear to answer every purpose that Simpson's operation effected. It is impossible to describe it better than in Barnes' own words:—*

"*The operation is this:* Pass one or two fingers as far as they will go through the os uteri, the hand being passed into the vagina if necessary; feeling the placenta, insinuate the finger between it and the uterine wall; sweep the finger round in a circle so as to separate the placenta as far as the finger can reach; if you feel the edge of the placenta, where the membranes begin, tear open the membranes carefully, especially if these have not been previously ruptured; ascertain, if you can, what is the presentation of the child before withdrawing your hand. Commonly, some amount of retraction of the cervix takes place after the operation, and *often the hemorrhage ceases.*"

It will be seen from what has been said that no one rule of practice can be definitely laid down for all cases of placenta prævia. Our treatment in each individual case must be guided by the particular conditions that are present; and, if only we bear in mind the natural history of the hemorrhage, we may confidently look to a favorable termination.

It may be useful, in conclusion, to recapitulate the rules which have been laid down for treatment in the form of a series of propositions:—

I. Before the child has reached a viable age, temporize, provided the hemorrhage be not excessive, until pregnancy has advanced sufficiently to afford a reasonable hope of saving the child. For this purpose the chief indication is absolute rest in bed, to which other accessory means of preventing hemorrhage, such as cold, astringent pessaries, etc., may be added.

II. In hemorrhage occurring after the seventh month of utero-gestation no attempt should be made to prolong the pregnancy.

III. In all cases in which it can be easily effected the membranes should be ruptured. By this means uterine contractions are favored and the bleeding vessels compressed.

IV. If the hemorrhage be stopped, the case may be left to nature. If flooding continue, and the os be not sufficiently dilated to admit of the labor being readily terminated by turning, the os and the vagina should be carefully plugged, while uterine contractions are promoted by abdominal bandages, uterine compression, and ergot. The plug must not be left in beyond a few hours.

V. If, on removal of the plug, the os be sufficiently expanded, and the general condition of the patient be good, the labor may be terminated by turning, the bi-polar method being used if possible. If the os be not open enough, it may be advantageously dilated by a Barnes' bag, which also acts as a plug.

VI. Instead of, or before resorting to, turning, the placenta may be separated around the site of its attachment to the cervix. This practice is specially to be preferred when the patient is much exhausted, and in a condition unfavorable for bearing the shock of turning.

SECTION XIV.

HEMORRHAGE FROM SEPARATION OF A NORMALLY SITUATED PLACENTA.

This is the form of hemorrhage which is generally described in obstetric works as "*accidental,*" in contra-distinction to the "*unavoidable*" hemorrhage of placenta prævia. In discussing the latter, we have seen that the term "accidental" is one that is apt to mislead, and that the causation of the hemorrhage in placenta prævia is, in some cases at least, closely allied to that of the variety of hemorrhage we are now considering.

When, from any cause, separation of a normally situated placenta occurs before delivery, more or less blood is necessarily effused from the ruptured utero-placental vessels, and the subsequent course of the case may be twofold. 1. The blood, or at least some part of it, may find its way between the membranes and the decidua, and escape from the os uteri. This constitutes the

* Selected Obst. Works, p. 68.

* Obstet. Operations, 2d ed., p. 417

typical "accidental" hemorrhage of authors. 2. The blood may fail to find a passage externally, and may collect internally, giving rise to very serious symptoms, and even proving fatal, before the true nature of the case is recognized. Cases of this kind are by no means so rare as the small amount of attention paid to them by authors might lead us to suppose; and, from the obscurity of the symptoms and difficulty of diagnosis, they merit special study. Dr. Goodell* has collected together no less than 106 instances in which this complication occurred.

Causes and Pathology.—The causes of placental separation may be very various. In a large number of cases it has followed an accident or exertion (such as slipping down-stairs, stretching, lifting heavy weights, and the like), which has probably had the effect of lacerating some of the placental attachments. At other times it has occurred without such appreciable cause, and then it has been referred to some change in the uterus, such as a more than usually strong contraction producing separation, or some accidental determination of blood causing a slight extravasation between the placenta and the uterine wall, the irritation of which leads to contraction and further detachment. Causes such as these, which are of frequent occurrence, will not produce detachment except in women otherwise predisposed to it. It generally is met with in women who have borne many children, more especially in those of weakly constitution and impaired health, and rarely in primiparæ. Certain constitutional states probably predispose to it, such as albuminuria, or exaggerated anæmia; and, still more so, degenerations and diseases of the placenta itself.

This form of hemorrhage rarely occurs to an alarming extent until the latter months of pregnancy, often not until labor has commenced. The great size of the placental vessels in advanced pregnancy affords a reasonable explanation of this fact.

Symptoms and Diagnosis.—If, after separation of a portion of the placenta, the blood finds its way between the membranes and the decidua, its escape per vaginam, even although in small amount, at once attracts attention, and reveals the nature of the accident. It is otherwise when we have to do with a case of concealed hemorrhage, the diagnosis of which is often a matter of difficulty. Then the blood probably at first collects between the uterus and the placenta. Sometimes marginal separation does not occur, and large blood-clots are formed in this situation, and retained there. More often, the margin of the placenta separates, and the blood collects between the membranes and the uterine wall, either towards the cervix, where the presenting part of the child may prevent its escape, or near the fundus. In the latter case especially the coagula are apt to cause very painful stretching and distension of the uterus. The blood may also find its way into the amniotic cavity, but more frequently it does not do so; probably, as Goodell has pointed out, because "should the os uteri be closed, the membranes, however delicate, cannot, other things being equal, rupture any sooner from the uterine walls, for the sum of the resistance of the inclosed liquor amnii being equally distributed exactly counterbalances the sum of the pressure exerted by the effusion." This point is of some practical importance because, after rupture of the membranes, the liquor amnii is frequently found untinged with blood, and this might lead us to suppose ourselves mistaken in our diagnosis, if this fact were not borne in mind.

Symptoms of Concealed Accidental Hemorrhage.—The most prominent symptoms in concealed internal hemorrhage are extreme collapse and exhaustion, for which no adequate cause can be assigned. These differ from those of ordinary syncope, with which they might be confounded, chiefly in their persistence and severity, and in the presence of the symptoms attending severe loss of blood, such as coldness and pallor of the surface, great restlessness and anxiety, rapid and sighing respiration, yawning, feeble, quick, and compressible pulse. When there is severe internal, with slight external hemorrhage, we may be led to a proper diagnosis by observing that the constitutional symptoms are much more severe than the amount of external hemorrhage would account for. Uterine pain is generally present, of a tearing and stretching character, sometimes moderate in amount, more often severe, and occasionally amounting to intolerable anguish. It is often localized, and it, doubtless, depends on the distension of the uterus by the retained coagula. If the distension be marked, there may be an irregularity in the form of the uterus at the site of sanguineous effusion; but this will be difficult to make out, except in women with thin and unusually lax abdominal parietes. A rapid increase in the size of the uterus has been described as a sign by Cazeaux and others. It is not very likely that this will be appreciable towards the end of utero-gestation, as a very large amount of effusion would be necessary to produce it. At an earlier period of pregnancy, at or about the fifth month, I made it out very distinctly in a case in my own practice. It obviously must have occurred to an enormous extent in a case related by Chevalier, in which post-mortem Cæsarean section was performed under the impression that the pregnancy had advanced to term, but only a three months' fœtus was found, imbedded in coagula which distended the uterus to the size of a nine months' gestation.* Labor pains may be entirely absent. If present, they are generally feeble, irregular, and inefficient.

Differential Diagnosis.—The only condition, besides ordinary syncope, likely to be confounded with this form of hemorrhage is rupture of the uterus, to which the intense pain and profound collapse induce considerable resemblance. The latter rarely occurs until after labor has been some time in progress, and after the escape of the liquor amnii; whereas hemorrhage usually occurs either before labor has commenced or at an early stage. The recession of the presentation, and the escape of the fœtus into the abdominal cavity, in cases of rupture, will further aid in establishing the diagnosis.

Prognosis.—The prognosis, when blood escapes externally, is, on the whole, not unfavorable. The nature of the case is apparent, and remedial measures are generally adopted sufficiently early to prevent serious mischief. It is different with the concealed form, in which the mortality is very great. Out of Goodell's 106 cases, no less than 54 mothers died. This excessive death-rate is, no doubt, partly due to the fact that extreme prostration so often occurs before the existence of hemorrhage is suspected, and partly to the accident generally happening in women of weakly and diseased constitution. The prognosis to the child is still more grave. Out of 107 children, only 6 were born alive. The almost certain death of the child may be explained by the fact that, when blood collects between the uterus and the placenta, the fœtal portion of the latter is probably lacerated, and the child then also dies from hemorrhage.

Treatment.—In this, as in all other forms of puerperal hemorrhage, the great hæmostatic is uterine contraction, and that we must try to encourage by all possible means. The first thing to be done, whether the hemorrhage be apparent or concealed, is to rupture the membranes. If the loss of blood be only slight, this may suffice to control it, and the case may then be left to nature. A firm abdominal binder should, however, be applied to prevent any risk of blood collecting internally, as there is nothing to prevent its filling the uterine cavity after the membranes are ruptured. Contraction may be further advantageously solicited by uterine compression, and by the administration of full doses of ergot. If hemorrhage continue, or if we have any reason to suspect concealed hemorrhage, the sooner the uterus is emptied the better. If the os be sufficiently dilated, the best practice will be to turn without further delay, using the bi-polar method if possible. If the os be not open enough, a Barnes' bag should be introduced, while firm pressure is kept up to prevent uterine accumulation. Should the collapsed condition of the patient be very marked, the mere shock of the operation might turn the scale against her. Under such circumstances it may be better practice to delay further procedure

* Amer. Journ. of Obstet., vol. ii.

* Journ. de Med. Clin. et Pharmac., vol. xxi., p. 363.

until, by the administration of stimulants, warmth, etc., we have succeeded in producing some amount of reaction, keeping up, in the meanwhile, firm pressure on the uterus. Should the head be low down in the pelvis, it may be easier to complete labor by means of the forceps.

SECTION XV.

HEMORRHAGE AFTER DELIVERY.

Hemorrhage during, or shortly after, the third stage of labor is one of the most trying and dangerous accidents connected with parturition. Its sudden and unexpected occurrence just after the labor appears to be happily terminated, and its alarming effect on the patient, who is often placed in the utmost danger in a few moments, tax the presence of mind and the resources of the practitioner to the utmost, and render it an imperative duty on every one who practises midwifery to make himself thoroughly acquainted with its causes, and preventive and curative treatment. There is no emergency in obstetrics which leaves less time for reflection and consultation, and the life of the patient will often depend on the prompt and immediate action of the medical attendant.

Frequency of Post-partum Hemorrhage.—Post-partum hemorrhage is one of the most frequent complications of delivery. I do not know of any statistics which enable us to judge with accuracy of its frequency, but I believe it to be an unquestionable fact that, especially in the upper ranks of society, it is very common indeed. This is probably due to the effects of civilization, and to the mode of life of patients of that class, whose whole surroundings tend to produce a lax habit of body which favors uterine inertia, the principal cause of post-partum hemorrhage. In the report of the Registrar-General for the five years, from 1872 to 1876, 3,524 deaths are attributed to flooding. The majority of these must have been caused by post-partum hemorrhage, although some may have been from other forms.

Generally a Preventable Accident.—Fortunately, it is, to a great extent, a preventable accident. I believe this fact cannot be too strongly impressed on the practitioner. If the third stage of labor be properly conducted, if every case be treated, as every case ought to be, as if hemorrhage were impending, it would be much more infrequent than it is. It is a curious fact that post-partum hemorrhage is much more common in the practice of some medical men than in that of others; the reason being, that those who meet with it often are careless in their management of their patients immediately after the birth of the child. That is just the time when the assistance of a properly qualified practitioner is of value, much more so than before the second stage of labor is concluded; hence when I hear that a medical man is constantly meeting with severe post-partum hemorrhage, I hold myself justified *ipso facto* in inferring that he does not know, or does not practise, the proper mode of managing the third stage of labor.

Causes and Nature's Method of Controlling Hemorrhage after Delivery.—The placenta, as we have seen, is separated by the last pains, and the blood, which in greater or less quantity accompanies the fœtus, probably comes from the utero-placental vessels which are then lacerated. Almost immediately afterwards the uterus contracts firmly, and, in a typical labor, assumes the hard cricket-ball form which is so comforting to the accoucheur to feel. The result is the compression of all the vascular trunks which ramify in its walls, both arteries and veins, and thus the flow of blood through them is prevented. By referring to what has been said as to the anatomy of the muscular fibres of the gravid uterus, especially at the placental site, it will be seen how admirably they are adapted for this purpose. The arrangement of the vessels themselves favors the hæmostatic action of uterine contraction. The large venous sinuses are placed in layers, one above the other, in the thickness of the uterine walls, and they anastomose freely. When the superimposed layers communicate with those immediately below them, the junction is by a falciform or semilunar opening in the floor of the vessel nearest the external surface of the uterus. Within the margins of this aperture there are muscular fibres, the contraction of which probably tends to prevent retrogression of blood from one layer of vessels into the other. The venous sinuses themselves are of a flattened form, and they are intimately attached to the muscular tissues. It is obvious, then, that these anatomical arrangements are eminently adapted to facilitate the closure of the vessels. They are, however, large, and are destitute of valves; and, if contraction be absent, or if it be partial and irregular, it is equally easy to understand why blood should pour forth in the appalling amount which is sometimes observed.

Importance of Tonic Uterine Contraction.—If uterine action be firm, regular, and continuous, the vessels must be sealed up, and hemorrhage effectually prevented. This fact has been doubted by many authorities. Gooch was the first to describe what he called "a peculiar form of hemorrhage" accompanying a contracted womb, and similar observations have been made by other writers, such as Velpeau, Rigby, and Gendrin. Simpson says, on this point, that strong uterine contractions "are not probably so essential a part in the mechanism of the prevention of hemorrhage from the open orifices of the uterine veins as we might *a priori* suppose."* With regard to Gooch's cases, it has been pointed out that his own description proves that, however firmly the uterus may have contracted immediately after the expulsion of the child, it must have subsequently relaxed, for he passed his hand into it to remove retained clots, a manœuvre which he could not have practised had tonic contraction been present. Barnes suggests that in some of these cases the hemorrhage came from a laceration of the cervix. Of course, blood may readily escape from mechanical injury of this kind, although the uterus itself be in a satisfactory state of contraction, and the possibility of this occurrence should always be borne in mind.

Although, then, we may admit that post-partum hemorrhage is incompatible with persistent contraction of the uterus, it by no means follows that the converse is true. On the contrary, it is not uncommon to meet with cases in which the uterus is large and apparently quite flaccid, and in which there is no loss of blood. Alternate relaxation and contraction of the uterus after delivery are also of constant occurrence, and yet hemorrhage, during the relaxation, does not take place. The explanation no doubt is that, immediately after the birth of the child, there was sufficient contraction to prevent hemorrhage, and that, during its continuance, coagula formed in the mouths of the uterine sinuses, by which they were sufficiently occluded to prevent any loss when subsequent relaxation occurred.

In all probability both uterine contraction and thrombosis are in operation in ordinary cases; and we shall presently see that all the means employed in the treatment of post-partum hemorrhage act by producing one or other of them.

Secondary Causes of Hemorrhage.—Uterine inertia after labor, then, may be regarded as the one great primary cause of post-partum hemorrhage; but there are various secondary causes which tend to produce it, one of the most frequent of which is exhaustion following a protracted labor. The uterus gets worn out by its efforts, and when the fœtus is expelled, it remains in a relaxed state, and hemorrhage results. Over-distension of the uterus acts in the same way. Hence hemorrhage is very frequently met with when there has been an excessive amount of liquor amnii, or in multiple pregnancies. One of the worst cases I ever met with was after the birth of triplets, the uterus having been of an enormous size. Rapid emptying of the uterus, during which there has not been sufficient time for complete separation of the placenta, often tends to the same result. This is the reason why hemorrhage so frequently follows forceps delivery, especially if the operation have been unduly hurried; and it is one of the chief dangers in what are termed "precipitate labors." The general condition of the patient may also strongly predispose to it. Thus it is more often met with in women who have borne families, especially if they be weakly in constitu-

*Selected Obstetric Works, p. 234.

tion, comparatively seldom in primiparæ; and for the same reason that after-pains are most common in the former, namely, that the uterus, weakened by frequent child-bearing, contracts inefficiently. The experience of practitioners in the tropics shows that European women, debilitated by the relaxing effects of warm climates, are peculiarly prone to it, and it forms one of the chief dangers of childbirth amongst the English ladies in India.

Irregular Uterine Contraction.—Another important cause of post-partum hemorrhage is partial and irregular contraction of the uterus. Part of the muscular tissue is firmly contracted, while another part is relaxed, and the latter very often the placental site. This has been especially dwelt on by Simpson. He says "the morbid condition which is most frequently and earliest seen in connection with post-partum hemorrhage, is a state of irregularity and want of equability in the contractile action of different parts of the uterus—and, it may be in different planes of the muscular fibres—as marked by one or more points in the organ feeling hard and contracted, at the same time that other portions of the parietes are soft and relaxed."

Hour-glass Contraction.—One peculiar variety, which has been much dwelt on by writers, and is a prominent bugbear to obstetricians, is the so-called "*hour-glass contraction.*" This in reality seems to depend on spasmodic contraction of the internal os uteri, by means of which the placenta becomes encysted in the upper portion of the uterus, which is relaxed. On introducing the hand, it first passes through the lax cervical canal, until it comes to the closed internal os, with the umbilical cord passing through it, which has generally been supposed to be a circular contraction of a portion of the body of the uterus.

Encystment of the placenta, however, although more rarely, unquestionably takes place in a portion only of the body of the uterus (Fig. 95). Then apparently the placental site remains more

Fig. 95.

Irregular Contraction of the Uterus, with Encystment of the Placenta.

or less paralyzed, with the placenta still attached, while the remainder of the body of the uterus contracts firmly, and thus encystment is produced.

Causes of Irregular Contractions.—These irregular contractions of the uterus are by no means so common as our older authors supposed. When they do occur I believe them almost invariably to depend on defective management of the third stage of labor. "The most frequent cause," says Rigby,* "is from over-anxiety to remove the placenta; the cord is frequently pulled at, and at length the os uteri is excited to contract." While this is being done, no attempts are probably being made to excite the fundus to proper action, and, therefore, the hour-glass contraction is established. Duncan says of this condition: "Hour-glass contraction cannot exist unless the parts above the contraction are in a state of inertia; were the higher parts of the uterus even in moderate action, the hour-glass contraction would soon be overcome." † If placental expression were always employed, if it were the rule to effect the expulsion of the placenta by a *vis à tergo*, instead of extracting by a *vis à fronte*, I feel confident that these irregular and spasmodic contractions—of the influence of which in producing hemorrhage there can be no question—would rarely, if ever, be met with. It is to be observed that even in these cases, it is not because the uterus is in a state of partial contraction, but because it is in a state of partial relaxation, that hemorrhage ensues.

Placental Adhesions.—Adhesions of the placenta to the uterine parietes may cause hemorrhage, especially if they be partial, and the remainder of the placentæ be detached. The frequency of these has been over-estimated. Many cases believed to be examples of adherent placentæ are, in reality, only cases of placentæ retained from uterine inertia. The experience of all who see much midwifery will probably corroborate the observation of Braun, that "abnormal adhesion and hour-glass contraction are more frequently encountered in the experience of the young practitioner, and they diminish in frequency in direct ratio to increasing years." The cause of adhesion is often obscure, but it most probably results from a morbid state of the decidua, which is produced by antecedent disease of the uterine mucous membrane: then the adhesion is apt to recur in subsequent pregnancies. The decidua is altered and thickened, and patches of calcareous and fibrous degeneration may be often found on the attached surface of the placenta. Most frequently the placenta is only partially adherent; patches of it remain firmly attached to the uterus, while the rest is separated: hence the uterine walls remain relaxed, and hemorrhage frequently follows. The diagnosis and management of these very troublesome cases will be found described under the head of treatment.

Constitutional Predisposition to Flooding.—Finally, I think it must be admitted that there are some women who really merit the appellation of "Flooders," which has been applied to them, and who, do what we may, have the most extraordinary tendency to hemorrhage after delivery. I do not think that these cases, however, are by any means so common as some have supposed.* I have attended several patients who have nearly lost their lives from post-partum hemorrhage in former labors, some who have suffered from it in every confinement, and I have only met with two cases in which the assiduous use of preventive treatment failed to avert it. In these (one of which I have elsewhere published in detail †), in spite of all my efforts, I could not succeed in keeping up uterine contraction, and the patients would certainly have lost their lives were it not for the means which modern improvements have fortunately placed at our disposal for producing thrombosis in the mouths of the bleeding vessels. The nature of these rare cases requires further investigation; possibly they may, to some extent, be the subjects of the so-called hemorrhagic diathesis.

Signs and Symptoms.—The loss of blood may commence immediately after the birth of the child, before the expulsion of the placenta, or not until some time afterwards, when the contracted uterus has again relaxed. It may commence gradually, or suddenly; in the latter case, it may begin with a gush, and in the worst form the bed-clothes, the bed, and even the floor, are deluged with the blood which, it is no exaggeration to say, is pouring from the patient. If now the hand be placed on the abdomen, we shall miss the hard, round ball of the contracted uterus, which will be found soft and flabby, or we may even be unable to make out its contour at all. If the hemorrhage be slight, or if we succeed in controlling it at once, no serious consequences follow; but if it be excessive, or if we fail to check it, the gravest results ensue.

Exhaustion in Extreme Cases.—There are few sights more appalling to witness than one of the worst cases of post-partum hemorrhage. The pulse becomes rapidly affected, and may be reduced to a mere thread, or it may become entirely imperceptible. Syncope often comes on, not in itself always an unfavorable occurrence, as it tends to promote thrombosis in the venous sinuses. Or, short of actual syncope, there may be a feeling of intense

* Rigby's Midwifery, p. 225. † Researches in Obstetrics, p. 389.

* Braun's Lectures, 1869. † Obst. Journ., vol. i.

debility and faintness. Extreme restlessness soon supervenes, the patient throws herself about the bed, tossing her arms wildly above her head; respiration becomes gasping and sighing, the "besoin de respirer" is actually felt, and the patient cries out for more air; the skin becomes deadly cold, and covered with profuse perspiration; if the hemorrhage continue unchecked, we next may have complete loss of vision, jactitation, convulsions, and death.

Formidable as such symptoms are, it is satisfactory to know that recovery often takes place, even when the powers of life seem reduced to the lowest ebb. If we can check the hemorrhage while there is still some power of reaction left, however slight, we may not unreasonably hope for eventual recovery. The constitution, however, may have received a severe shock, and it may be months, or even years, before the patient recovers from the effects of only a few minutes' hemorrhage. A death-like pallor frequently follows these excessive losses, and the patient often remains blanched and exsanguine for a long time.

Preventive Treatment.—The preventive treatment of post-partum hemorrhage should be carefully practised in every case of labor, however normal. If the practitioner make a habit of never removing his hand from the uterus after the birth of the child until the placenta is expelled, and of keeping up continuous uterine contraction for at least half an hour after delivery is completed, not necessarily by friction on the fundus, but by simply grasping the contracted womb with the palm of the hand and preventing its undue relaxation, cases of post-partum flooding will seldom be met with. As a rule we should, I think, not apply the binder until at least that time has elapsed. The binder is an effective means of keeping up, but not of producing, contraction, and it should never be trusted to for the latter purpose. If it be put on too soon, the uterus may relax under it, and become filled with clots without the practitioner knowing anything about it; whereas this cannot possibly take place as long as the uterine globe is held in the hollow of the hand. I have seen more than one serious case of concealed hemorrhage result from the too common habit of putting on the binder immediately after the removal of the placenta. I believe also, as I have formerly said, that it is thoroughly good practice to administer a full dose of the liquid extract of ergot in all cases after the placenta has been expelled, to insure persistent contraction, and to lessen the chance of blood-clots being retained in utero.

These are the precautions which should be used in all cases alike; but when we have reason to fear the occurrence of hemorrhage, from the history of previous labors or other cause, special care should be taken. The ergot should be given, and preferably in the form of the subcutaneous injection of ergotine, before the birth of the child, when the presentation is so far advanced that we estimate that labor will be concluded in from ten to twenty minutes, as we can hardly expect the drug to produce any effect in less time. Particular attention, moreover, should then be paid to the state of the uterus. Every means should be taken to insure regular and strong contraction, and it is advisable to rupture the membranes early, as soon as the os is dilated or dilatable, to insure stronger uterine action. If any tendency to relaxation occur after delivery, a piece of ice should be passed into the vagina, or into the uterus. Should coagula collect in the uterus, they may be readily expelled by firm pressure on the fundus, and the finger should be passed occasionally up to the cervix, and any which are felt there should be gently picked away.

We should be specially on our guard in all cases in which the pulse does not fall after delivery. If it beat at 100 or more some ten minutes or a quarter of an hour after the birth of the child, hemorrhage not unfrequently follows; and, hence, it is a good practical rule, which may save much trouble, that a patient should never be left unless the pulse has fallen to its natural standard.

Curative Treatment.—As there are only two means which nature adopts in the prevention of post-partum hemorrhage, so the remedial measures may also be divided into two classes. 1. Those which act by the production of uterine contraction. 2. Those which act by producing thrombosis in the vessels. Of these the first are the most commonly used; and it is only in the worst cases, in which they have been assiduously tried and have failed, that we resorted to those coming under the second heading.

Uterine Pressure.—The patient should be placed on her back, in which position we can more readily command the uterus, as well as attend to her general state. If the uterus be found relaxed and full of clots, by firmly grasping it in the hand contraction may be evoked, its contents expelled, and further hemorrhage at once arrested. Should this fortunately be the case, we must keep up contraction by gently kneading the uterus, until we are satisfied that undue relaxation will not recur. The powerful influence of friction in promoting contraction cannot be doubted, and nothing will replace it; no doubt it is fatiguing, but as long as it is effectual it must be kept up. No roughness should be used, as we might produce subsequent injury, but it is quite possible to use considerable pressure without any violence.

Another method of applying uterine pressure has been strongly advocated by Dr. Hamilton, of Falkirk, and it may be serviceable where there is a constant draining from the uterus, and a capacious pelvis. It consists in passing the fingers of the right hand high up in the posterior cul-de-sac of the vagina, so as to reach the posterior surface of the uterus, while counter-pressure is exercised by the left hand through the abdomen. The anterior and posterior walls of the uterus are thus closely pressed together.

Administration of Ergot.—During the time that pressure is being applied, attention can be paid to general treatment; and in giving his directions to the by-standers the practitioner should be calm and collected, avoiding all hurry and excitement. A full dose of ergot should be administered, and if one have already been given, it should be repeated. We cannot, however, look upon ergot as anything but a useful accessory, and it is one which requires considerable time to operate. The hypodermic use of ergotine offers the double advantage, in severe cases, of acting with greater power, and much more rapidly than the usual method of administration. It should, therefore, always be used in preference.

Stimulants.—The sudden flow will probably have produced exhaustion and a tendency to syncope, and the administration of stimulants will be necessary. The amount must be regulated by the state of the pulse, and the degree of exhaustion. There is no more absurd mistake, however, than implicitly relying on the brandy bottle to check post-partum hemorrhage. In the worst cases absorption is in abeyance, and brandy may be poured down in abundance, the practitioner believing that he is rousing his patient, while he is, in fact, only filling the stomach with a quantity of fluid, which is eventually thrown up unaltered. I have more than once seen symptoms, produced by the over-free use of brandy in slight floodings, which were certainly not those of hemorrhage. I remember on one occasion being summoned by a practitioner, with a view to transfusion, to a patient who was said to be insensible and collapsed from hemorrhage. I found her, indeed, unconscious; but with a flushed face, a bounding pulse, a firmly contracted uterus, and deep stertorous breathing. On inquiry, I ascertained that she had taken an enormous quantity of brandy, which had brought on the coma of profound intoxication, while the hemorrhage had obviously never been excessive.

Hypodermic Injection of Ether.—The hypodermic injection of sulphuric ether has been recommended as a powerful stimulant in cases in which exhaustion is very great. A fluidrachm may be injected, and the remedy is worthy of trial, when the tendency to syncope is extreme.

Fresh Air, etc.—The windows should be thrown widely open, to allow a current of fresh, cold air to circulate freely through the room. The pillows should be removed, the head kept low, and the patient should be assiduously fanned.

Emptying of Uterus.—If bleeding continue, or if it commence before the placenta is expelled, the hand should be carefully and gently passed into the uterus, and its cavity cleared of its contents.

The mere presence of the hand within the uterus is a powerful incitor of uterine action. When the placenta is retained it is the more essential, as the hemorrhage cannot possibly be checked as long as the uterus is distended by it. During the operation the uterus should be supported by the left hand externally, and, by using the two hands in concert, the chances of injuring the textures are greatly lessened.

Treatment of Hour-glass Contraction.—If the so-called "hour-glass contraction" be present, or if the placenta be morbidly adherent, the operation will be more difficult, and will require much judgment and care. The spasmodic contraction of the inner os in the former case may generally be overcome by gentle and continuous pressure of the fingers passed within the contraction, while the uterus is supported from without. By this means, too, further hemorrhage can in most cases be controlled, until the spasm is sufficiently relaxed to admit of the passage of the hand.

Signs of Adherent Placenta.—There are no very reliable signs to indicate morbid adhesion of the placenta, previous to the introduction of the hand. The following are the symptoms as laid down by Barnes, any of which might, however, accompany non-detachment of the placenta, unaccompanied by adhesion: "You may suspect morbid adhesion, if there have been unusual difficulty in removing the placenta in previous labors; if, during the third stage, the uterus contracts at intervals firmly, each contraction being accompanied by blood, and yet, on following up the cord, you feel the placenta *in utero;* if on pulling on the cord, two fingers being pressed into the placenta at the root, you feel the placenta and uterus descend in one mass, a sense of dragging pain being elicited; if, during a pain the uterine tumor does not present a globular form, but be more prominent than usual at the place of placental attachment."*

Treatment of Adherent Placenta.—The artificial removal of an adherent placenta is always a delicate and anxious operation, which, however carefully performed, must of necessity expose the patient to the risk of injury to the uterine structures, and of leaving behind portions of placental tissue, which may give rise to secondary hemorrhage, or septicæmia. The cord will guide the hand to the site of attachments, and the fingers must be very gently insinuated between the lower edge of the placenta and the uterine wall; or, if a portion be already detached, we may commence to peel off the remainder at that spot. Supporting the uterus externally, we carefully pick off as much as possible, proceeding with the greatest caution, as it is by no means easy to distinguish between the placenta and the uterus. At the best it is far from easy to remove all, and it is wiser to separate only what we readily can, than to make too protracted efforts at complete detachment. When it is found to be impossible to detach and remove the whole, or a great part of the placenta, we cannot but look upon the further progress of the case with considerable anxiety. The retained portions may be, ere long, spontaneously detached and expelled, or they may be decomposed and give rise to fetid discharge and septic infection. Such cases must be treated by antiseptic intra-uterine injections, so as to lessen the risk of absorption as much as possible; but until the retained masses have been expelled, and the discharge has ceased, the patient must be considered to be in considerable danger. In a few rare cases, there is reason to believe that considerable masses of retained placental tissue have been entirely absorbed. It is difficult to understand so strange a phenomenon, but several well-authenticated cases are recorded, in which there seems no reason to doubt that the retained placenta was removed in this way.†

Excitement of Reflex Action by Cold, etc.—Various means are used for exciting uterine contraction by reflex stimulation. Amongst the most important of these is cold. In patients who are not too exhausted to respond to the stimulus applied, it is of extreme value. But, to be of use, it should be used intermittently, and not continuously. Pouring a stream of cold water from a height on the abdomen is a not uncommon, but bad practice, as it deluges the patient and the bedding in water, which may afterwards act injuriously. Flapping the lower part of the abdomen with a wet towel is less objectionable. Ice can generally be obtained, and a piece should be introduced into the uterus. This is a very powerful hæmostatic, and often excites strong action when other means fail. I constantly employ it, and have never seen any bad results follow. A large piece of ice may also be held over the fundus, and removed, and re-applied from time to time. Iced water, may be injected into the rectum. A very powerful remedy is washing out the uterine cavity with a stream of cold water, by means of a vaginal pipe of a Higginson's syringe carried up to the fundus. Another means of applying cold, said to be very effectual, is the application of the ether spray, such as is used for producing local anæsthesia, over the lower part of the abdomen.* All these remedies, however, depend for their good results on the fact of the patient being in a condition to respond to stimulus; and their prolonged use, if they fail to excite contraction rapidly, will certainly prove injurious. Rigby used to look upon the application of the child to the breast as one of the most certain incitors of uterine action. It may be of service, after the hemorrhage has been checked, in keeping up tonic contraction, and should therefore not be omitted; but we certainly cannot waste time in inducing the child to suck in the face of the actual emergency.

Intra-uterine Injections of Warm Water.—Of late, intra-uterine injections of warm water, at a temperature of from 100° to 120°, have been highly recommended as a powerful means of arresting post-partum hemorrhage, often proving effectual when all other treatment has failed. The number of published cases in which it has proved of great value is now considerable. The present master of the Rotunda, Dr. Lombe Atthill, has recorded 16 cases† in which it checked hemorrhage at once, in many of which ergot, ice, and other means had failed. He speaks of it as especially useful in those troublesome cases in which the uterus alternately relaxes and hardens, and resists all our efforts to produce permanent contraction. My own experience of this treatment is very favorable. I have now used it in several cases, in some of which the tendency to hemorrhage was very great, and in every instance it has at once produced strong uterine action, and instantly checked the flow. It is, moreover, much more agreeable to the patient than cold applications. I think it cannot be doubted that we have in these warm irrigations a valuable addition to our methods of treating uterine hemorrhage.

State of the Bladder.—The late Dr. Earle pointed out‡ that a distended bladder often prevents contraction, and to avoid the possibility of this the catheter should be passed.

Plugging of the Vagina.—Plugging of the vagina has often been used. It is only necessary to mention it for the purpose of insisting on its absolute inapplicability in all cases of post-partum hemorrhage; the only effect it could have would be to prevent the escape of blood externally, which might then collect to any extent in the cavity of the uterus.

Compression of the abdominal aorta is highly thought of by many continental authorities, but is little known or practised in this country. It has been objected to by some on the theoretical ground that the hemorrhage is chiefly venous, and not arterial, and that it would only favor the reflux of venous blood into the vena cava. Cazeaux points out that, on account of the close anatomical relations between the aorta and the vena cava, it is hardly possible to compress one vessel without the other. The backward flow of blood, therefore, through the vena cava may also be thus arrested. There is strong evidence in favor of the occasional utility of compression. Its chief recommendation is, that it can be practised immediately, and by an assistant who can be shown how to apply the pressure. It is most likely to prove useful in sudden and severe hemorrhage, and, if it only control the loss for a few moments, it gives us time

*Obstetric Operations, p. 440.

†See an interesting paper by Dr. Thrush on "Retention of the Placenta in Labor at Term." Am. Journ. of Obstet., July, 1877.

*Griffiths, Practitioner, March, 1877. †Lancet, February 9, 1878.

‡Earle's Flooding after Delivery, p. 163.

to apply other methods of treatment. As a temporary expedient, therefore, it should be borne in mind, and adopted when necessary. It has the great advantage of supplementing, without superseding, other and more radical plans of treatment. The pressure is very easily applied, on account of the lax state of the abdominal walls. The artery can readily be felt pulsating above the fundus uteri, and can be compressed against the vertebræ by three or four fingers applied lengthways. Baudelocque, who was a strong advocate of this procedure, states that he has, on several occasions, controlled an otherwise intractable hemorrhage in this way, and that he, on one occasion, kept up compression for four consecutive hours. Cazeaux believes that compression of the aorta may have a further advantageous effect in retaining the mass of the blood in the upper part of the body, and thus lessening the tendency to syncope and collapse. If an aortic tourniquet, such as is used for compressing the vessel in cases of aneurism, could be obtained, it might be used with advantage in serious cases.

Bandaging of the Extremities.—When the hemorrhage has been excessive, and there is profound exhaustion, firm bandaging of the extremities, by preference with Esmarch's elastic bandages if they can be obtained, may be advantageously adopted with the view of retaining the blood as much as possible in the trunk, and thus lessening the tendency to syncope. As a temporary expedient in the worst class of cases it may occasionally prove of service.

Infection of Styptics.—Supposing these means fail, and the uterus obstinately refuses to contract in spite of all our efforts—and, do what we may, cases of this kind will occur—the only other agent at our command is the application of a powerful styptic to the bleeding surface to produce thrombosis in the vessels. "The latter," says Dr. Ferguson,* alluding to this means of arresting hemorrhage, "appears to be the sole means of safety in those cases of intense flooding in which the uterus flaps about the hand like a wet towel. Incapable of contraction for hours, yet ceasing to ooze out a drop of blood, there is nothing apparently between life and death but a few soft coagula plugging up the sinuses." These form but a frail barrier indeed, but the experience of all who have used the injection of a solution of perchloride of iron in such cases, proves that they are thoroughly effectual, and its introduction into practice is one of the greatest improvements in modern midwifery. Although this method of treating these obstinate cases is not new, since it was practised long ago in Germany, its adoption in this country is unquestionably due to the energetic recommendation of Dr. Barnes. Although the dangers of the practice have been strongly insisted on, and with a degree of acrimony that is to be regetted, I know of only one published case in which its use has been followed by any evil effects. Its extraordinary power, however, of instantly checking the most formidable hemorrhage, has been demonstrated by the unanimous testimony of all who have tried it. As it is not proposed by any one that this means of treatment should be employed until all ordinary methods of evoking contraction have failed, and as, in cases of this kind, the lives of the patients are of necessity imperilled, we should be fully justified in adopting it, even if its possible injurious effects had been much more certainly proved. It is surely at any time justifiable to avoid a great and pressing peril by running a possible chance of a less one. Whenever, therefore, we have tried the plans above indicated in vain, no time should be lost in resorting to this expedient. No practitioner should attend a case of midwifery without having the necessary styptic with him. The best and most easily obtainable form of using the remedy is the "liquor ferri perchloridi fortior" of the London Pharmacopœia, which should be diluted for use with six times its bulk of water. This is certainly better than a weaker solution. The vaginal pipe of a Higginson's syringe, through which the solution has once or twice been pumped to exclude the air, is guided by the hand to the fundus uteri, and the fluid injected gently over the uterine surface. The loose and flabby mucous membrane is instantaneously felt to pucker up, all the blood with which the fluid comes in contact is coagulated and the hemorrhage is immediately arrested. I think it is of importance to make sure that the uterus and vagina are emptied of clots before injection. In the only cases in which I have seen any bad symptoms follow, this precaution had been neglected. The iron hardened all the coagula, which remained in utero, and septicæmia supervened; which, however, disappeared after the clots had been broken up and washed away by intra-uterine antiseptic injections. After we have resorted to this treatment, all further pressure on the uterus should be stopped. We must remember that we have now abandoned contraction as an hæmostatic, and are trusting to thrombosis, and that pressure might detach and lessen the coagula which are preventing the escape of blood.

Other local astringents may be eventually found to be of use. Tincture of matico possibly might be serviceable, although I am not aware that it has been tried. Dupierris has advocated tincture of iodine, and has recorded 24 cases in which he employed it, in all without accident and with a successful issue. Penrose strongly recommends common vinegar, which has the advantage of being always readily obtainable. But nothing seems likely to act so immediately or so effectually, as the perchloride of iron.

Hemorrhage from Laceration of Maternal Structures.—A word may here be said as to the occasional dependence of hemorrhage after delivery on laceration of the cervix, or other injury to the maternal soft parts. Duncan has narrated a case in which the bleeding came from a ruptured perineum. If hemorrhage continue after the uterus is permanently contracted, a careful examination should be made to ascertain if any such injury exist. Most generally the source of bleeding is the cervix, and the flow can be readily arrested by swabbing the injured textures with a sponge saturated in a solution of the perchloride.

Secondary Treatment.—The secondary treatment of post-partum hemorrhage is of importance. When reaction commences, a train of distressing symptoms often show themselves, such as intense and throbbing headache, great intolerance of light and sound, and general nervous prostration; and, when these have passed away, we have to deal with the more chronic effects of profuse loss of blood. Nothing is so valuable in relieving these symptoms as opium. It is the best restorative that can be employed, but it must be administered in larger doses than usual. Thirty to forty drops of Battley's solution should be given by the mouth, or in an enema. At the same time the patient should be kept perfectly still and quiet, in a darkened room, and the visits of anxious friends strictly forbidden. Strong beef essence or gravy soup, milk, or eggs beat up with milk, and similar easily absorbed articles of diet, should be given frequently, and in small quantities at a time. Stimulants will be required according to the state of the patient, such as warm brandy and water, port wine, etc. Rest in bed should be insisted on, and continued much beyond the usual time. Eventually the remedies which act by promoting the formation of blood, such as the various preparations of iron, will be found useful, and may be required for a length of time.

Transfusion.—Under the head of transfusion I have separately treated the application of that last resource in those desperate cases in which the loss of blood has been so excessive as to leave no other hope.

Secondary Post-partum Hemorrhage.—In the majority of cases, if a few hours have elapsed after delivery without hemorrhage, we may consider the patient safe from the accident. It is by no means very rare, however, to meet with even profuse losses of blood coming on in the course of convalescence, at a time varying from a few hours, or days, up to several weeks after delivery. These cases are described as examples of "*secondary hemorrhage*," and they have not received at all an adequate amount of attention from obstetric writers, inasmuch as they often give rise to very serious, and even fatal results, and are always somewhat obscure in their etiology, and difficult to treat. We owe almost all our knowledge of this condition to an excellent paper by Dr. McClintock, of Dublin, who has collected characteristic examples from the writings of various

*Preface to Gooch On Diseases of Women, p. xlii.

authors, and accurately described the causes which are most apt to produce it.

Profuse Lochial Discharge.—We must in the first place, distinguish between true secondary hemorrhage and profuse lochial discharge, continued for a longer time than usual. The latter is not a very uncommon occurrence, and is generally met with in cases in which involution of the uterus has been checked; as by too early exertion, general debility, and the like. The amount of the lochial discharge varies in different women. In some patients it habitually continues during the whole puerperal month, and even longer, but not to an extent which justifies us in including it under the head of hemorrhage. In such cases prolonged rest, avoidance of the erect posture, occasional small doses of ergot, and, it may be, after the lapse of some weeks, astringent injections of oak bark, or alum, will be all that is necessary in the way of treatment.

True secondary hemorrhage is often sudden in its appearance and serious in its effects. McClintock mentions 6 fatal cases, and Mr. Bassett, of Birmingham,* has recorded 13 examples which came under his own observation, 2 of which ended fatally.

The Causes are either Constitutional or Local.—The causes may be either constitutional, or some local condition of the uterus itself.

Among the former are such as produce a disturbance of the vascular system of the body generally, or of the uterine vessels in particular. The state of the uterine sinuses, and the slight barrier which the thrombi formed in them offer to the escape of blood, readily explain the fact of any sudden vascular congestion producing hemorrhage. Thus mental emotions, the sudden assumption of the erect posture, any undue exertion, the incautious use of stimulants, a loaded condition of the bowels, or sexual intercourse shortly after delivery, may act in this way. McClintock records the case of a lady in whom very profuse hemorrhage occurred on the twelfth day after labor, when sitting up for the first time. Feeling faint after suckling, the nurse gave her some brandy, whereupon a gush of blood ensued, "deluging all the bedclothes and penetrating through the mattress so as to form a pool on the floor." Here the erect position, the exquisite pain caused by nursing, and the stimulating drink, all concurred to excite the hemorrhage. In another instance the flooding was traced to excitement produced by the sudden return of an old lover on the eighth day after labor. Moreau especially dwells on the influence of local congestion produced by a loaded condition of the rectum. Constitutional affections producing general debility, and an impoverished state of the blood, probably also may have the same effect. Blot specially mentions albuminuria as one of these, and Saboia states that in Brazil secondary hemorrhage is a common symptom of miasmatic poisoning, and can only be cured by change of air and the free use of quinine.†

Local Causes.—Local conditions seem, however, to be more frequent factors in the production of secondary hemorrhage. These may be generally classed under the following heads:—

1. Irregular and inefficient contraction of the uterus.
2. Clots in the uterine cavity.
3. Portions of retained placenta or membranes.
4. Retroflexion of the uterus.
5. Laceration or inflammatory state of the cervix.
6. Thrombosis or hæmatocele of the cervix or vulva.
7. Inversion of the uterus.
8. Fibroid tumors or polypus of the uterus.

The first four of these need only now be considered, the others being described elsewhere.

Relaxation of, and Clots in, the Uterus.—Relaxation of the uterus and distension of its cavity by coagula may give rise to hemorrhage, although not so readily as immediately after delivery, for coagula of considerable size are often retained in utero for many days after labor. The uterus will be found larger than it ought to be, and tender on pressure. Usually the coagula are expelled with severe after-pains; but this may not take place, and hemorrhage may ensue several days after delivery. Or there may be only a relaxed state of the uterus without retained coagula. Bassett relates 4 cases traced to these causes, and several illustrations will be found in McClintock's paper. Portions of retained placenta or membranes are more frequent causes. The retention may be due to carelessness on the part of the practitioner, especially if he have removed the placenta by traction, and failed to satisfy himself of its integrity. It may, however, often be due to circumstances entirely beyond his control; such as adherent placenta, which it is impossible to remove without leaving portions in utero, or more rarely placenta succenturia. In the latter case there is a small supplementary portion of placental tissue developed entirely separate from the general mass, and it may remain in utero without the practitioner having the least suspicion of its existence. Portions of the membranes are very apt to be left in utero. It is to prevent this that they should be twisted into a rope, and extracted very gently after expression of the placenta. Hemorrhage from these causes generally does not occur until at least a week after delivery, and it may not do so until a much longer time has elapsed. In 4 cases, recorded by Mr. Bassett, it commenced on the twelfth, tenth, fourteenth, and thirty-second day. It may come on suddenly and continue; or it may stop, and recur frequently at short intervals. In my experience retention of portions of the placenta is very common after abortion, when adhesions are more generally met with than at term. In addition to the hemorrhage there is often a fetid discharge, due to decomposition of the retained portion, and possibly more or less marked septicæmic symptoms, which may aid in the diagnosis. The placenta or membranes may simply be lying loose as foreign bodies in the uterine cavity; or they may be organically attached to the uterine walls, when their removal will not be so easily effected.

Retroflexion.—Barnes has especially pointed out the influence of retroflexion of the uterus in producing secondary hemorrhage,* which seems to act by impeding the circulation at the point of flexion, and thus arresting the process of involution.

In every case in which secondary hemorrhage occurs to any extent, careful investigation into the possible causes of the attack, and an accurate vaginal examination, are imperatively required. If it be due to general and constitutional causes only, we must insist on the most absolute rest on a hard bed in a cool room, and on the absence of all causes of excitement. The liquid extract of ergot will be very generally useful in ʒj doses repeated every six hours. McClintock strongly recommends the tincture of Indian hemp, which may be advantageously combined with the ergot, in doses of 10 or 15 minims, suspended in mucilage. Astringent vaginal pessaries of matico or perchloride of iron may be used. Special attention should be paid to the state of the bowels, and, if the rectum be loaded, it should be emptied by enemata. In more chronic cases a mixture of ergot, sulphate of iron, and small doses of sulphate of magnesia, will prove very serviceable. This is more likely to be effectual when the bleeding is of an atonic and passive character. McClintock speaks strongly in favor of the application of a blister over the sacrum. When the hemorrhage is excessive, more effectual local treatment will be required. Cazeaux advises plugging of the vagina. Although this cannot be considered so dangerous as immediately after delivery, inasmuch as the uterus is not so likely to dilate above the plug, still it is certainly not entirely without risk of favoring concealed internal hemorrhage. If it be used at all, a firm abdominal pad should be applied, so as to compress the uterus; and the abdomen should be examined, from time to time, to insure against the possibility of uterine dilatation. With these precautions the plug may prove of real value. In any case of really alarming hemorrhage I should be disposed rather to trust to the application of styptics to the uterine cavity. The injection of fluid in bulk, as after delivery, could not be safely practised, on

* Brit. Med. Jour., 1872.

† Saboia, Traité des Accouchements, p. 819.

* Obstetric Operations, p. 492.

account of the closure of the os and the contraction of the uterus. But there can be no objection to swabbing out the uterine cavity with a small piece of sponge attached to a handle, and saturated in a solution of the perchloride of iron. There are few cases which will resist this treatment.

If we have reason to suspect retained placenta or membranes, or if the hemorrhage continue or recur after treatment, a careful exploration of the interior of the womb will be essential. On vaginal examination, we may possibly feel a portion of the placenta protruding through the os, which can then be removed without difficulty. If the os be closed, it must be dilated with sponge or laminaria tents, or by a small-sized Barnes' bag, and the uterus can then be thoroughly explored. This ought to be done under chloroform, as it cannot be effectually accomplished without introducing the whole hand into the vagina, which necessarily causes much pain. If the placenta or membranes be loose in the uterine cavity, they may be removed at once; or, if they be organically attached, they may be carefully picked off. The uterus should at the same time, and as long as the os remains patulous, be thoroughly washed out with Condy's fluid and water, to diminish the risk of septicæmia.

Retroflexion can readily be detected by vaginal examination, and the treatment consists in careful reposition with the hand, and the application of a large-sized Hodge's pessary.

SECTION XVI.

RUPTURE OF THE UTERUS, ETC.

Rupture of the uterus is one of the most dangerous accidents of labor, and until of late years it has been considered almost necessarily fatal, and beyond the reach of treatment. Fortunately it is not of very frequent occurrence, although the published statistics vary so much that it is by no means easy to arrive at any conclusion on this point. The explanation is, no doubt, that many of the tables confound partial and comparatively unimportant lacerations of the cervix and vagina, with rupture of the body and fundus. It is only in large lying-in institutions, where the results of cases are accurately recorded, that anything like reliable statistics can be gathered, for in private practice the occurrence of so lamentable an accident is likely to remain unpublished. To show the difference between the figures given by authorities, it may be stated that, while Burns calculates the proportion to be 1 in 940 labors, Ingleby fixes it as 1 in 1,300 or 1,400, Churchill as 1 in 1,331, and Lehmann as 1 in 2,433. Dr. Jolly, of Paris, has published an excellent thesis containing much valuable information.* He finds that out of 782,741 labors, 230 ruptures, excluding those of the vagina or cervix, occurred, that is, 1 in 3,403.

Seat of Rupture.—Lacerations may occur in any part of the uterus—the fundus, the body, or the cervix. Those of the cervix are comparatively of small consequence, and occur, to a slight extent, in almost all first labors. Only those which involve the supra-vaginal portion are of really serious import. Ruptures of the upper part of the uterus are much less frequent than of the portion near the cervix; partly, no doubt, because the fundus is beyond the reach of the mechanical causes to which the accident can, not unfrequently be traced, and partly because the lower third of the organ is apt to be compressed between the presenting part and the bony pelvis. The site of placental insertion is said by Madame La Chapelle to be rarely involved in the rupture, but it does not always escape, as numerous recorded cases prove. The most frequent seat of rupture is near the junction of the body and neck, either anteriorly or posteriorly, opposite the sacrum, or behind the symphysis pubis, but it may occur at the sides of the lower segment of the uterus. In some cases the entire cervix has been torn away, and separated in the form of a ring.

Rupture may be Partial or Complete.—The laceration may be partial or complete; the latter being the more common. The muscular tissue alone may be torn, the peritoneal coat remaining intact; or the converse may occur, and then the peritoneum is often fissured in various directions, the muscular coat being unimplicated. The extent of the injury is very variable: in some cases being only a slight tear, in others forming a large aperture sufficiently extensive to allow the fœtus to pass into the abdominal cavity. The direction of the laceration is as variable as the size, but it is more frequently vertical than transverse or oblique. The edges of the tear are irregular and jagged; probably on account of the contraction of the muscular fibres, which are frequently softened, infiltrated with blood, and even gangrenous. Large quantities of extravasated blood will be found in the peritoneal cavity; such hemorrhage, indeed, being one of the most important sources of danger.

Causes are either Predisposing or Exciting.—The causes are divided into *predisposing* and *exciting;* and the progress of modern research tends more and more to the conclusion that the cause which leads to the laceration could only have operated because the tissue of the uterus was in a state predisposed to rupture, and that it would have had no such effect on a perfectly healthy organ. What these predisposing changes are, and how they operate, is yet far from being known, and the subject offers a fruitful field for pathological investigation.

Said to be more Common in Multiparæ.—It is generally believed that lacerations are more common in multiparæ than in primiparæ. Tyler Smith contended that ruptures are relatively as common in first as in subsequent labors. Statistics are not sufficiently accurate or extensive to justify a positive conclusion, but it is reasonable to suppose that the pathological changes, presently to be mentioned as predisposing to laceration, are more likely to be met with in women whose uteri have frequently undergone the alteration attendant on repeated pregnancies. Age seems to have considerable influence, as a large proportion of cases have occurred in women between thirty and forty years of age.

Alteration in the tissues of the uterus are probably of very great importance in predisposing to the accident, although our information on this point is far from accurate. Among these are morbid states of the muscular fibres, the result of blows and contusions during pregnancy; premature fatty degeneration of the muscular tissues, an anticipation, as it were, of the normal involution after delivery; fibroid tumors, or malignant infiltration of the uterine walls, which either produce a morbid state of the tissues, or act as an impediment to the expulsion of the fœtus. The importance of such changes has been specially dwelt on by Murphy in this country, and by Lehmann in Germany, and it is impossible not to concede their probable influence in favoring laceration. However, as yet these views are founded more on reasonable hypothesis than on accurately observed pathological facts.

Another and very important class of predisposing causes are those which lead to a want of proper proportion between the pelvis and the fœtus.

Deformity in Pelvis is a Frequent Cause.—Deformity of the pelvis has been very frequently met with in cases in which the uterus has ruptured. Thus out of 19 cases carefully recorded by Radford,* the pelvis was contracted in 11, or more than one-half. Radford makes the curious observation that ruptures seem more likely to occur when the deformity is only slight; and he explains this by supposing that in slight deformities the lower segment of the uterus engages in the brim, and, is therefore, much subjected to compression, while in extreme deformity the os and cervix uteri remain above the brim, the body and fundus of the uterus hanging down between the thighs of the mother. This explanation is reasonable; but the rarity with which ruptured uterus is associated with extreme pelvic deformity may rather depend on the infrequency of advanced degrees of contraction.

Malpresentation.—Amongst causes of disproportion depending on the fœtus are either malpresentation, in which the pains cannot

* Rupture utérine pendant le Travail, Paris, 1873.

* Obst. Trans., vol. viii.

effect the expulsion, or undue size of the presenting part. In the latter way may be explained the observation that rupture is much more frequently met with male than with female children, on account, no doubt, of the larger size of the head in the former. The influence of intra-uterine hydrocephalus was first prominently pointed out by Sir James Simpson,* who states that out of 74 cases of intra-uterine hydrocephalus the uterus ruptured in 16. In all such cases of disproportion, whether referable to the pelvis or fœtus, rupture is produced in a twofold manner, either by the excessive and fruitless uterine contractions, which are induced by the efforts of the organ to overcome the obstacle; or by the compression of the uterine tissue between the presenting part and the bony pelvis, leading to inflammation, softening, and even gangrene.

Mechanical Injury of Rupture.—The proximate cause of rupture may be classed under two heads—mechanical injury, and excessive uterine contraction. Under the former are placed those uncommon cases in which the uterus lacerates as the result of some injury in the latter months of pregnancy, such as blows, falls, and the like. Not so rare, unfortunately, are lacerations produced by unskilled attempts at delivery on the part of the medical attendant, such as by the hand during turning, or by the blades of the forceps. Many such cases are on record, in which the accoucheur has used force and violence, rather than skill, in his attempts to overcome an obstacle. That such unhappy results of ignorance are not so uncommon as they ought to be is proved by the figures of Jolly, who has collected 71 cases of rupture during podalic version, 37 caused by the forceps, 10 by the cephalotribe, and 30 during other operations, the precise nature of which is not stated.† The *modus operandi* of protracted and ineffectual uterine contractions, as a proximate cause of rupture, is sufficiently evident, and need not be dwelt on. It is necessary to allude, however, to the effect of ergot, incautiously administered, as a producing cause. There is abundant evidence that the injudicious exhibition of this drug has often been followed by laceration of the unduly stimulated uterine fibres. Thus, Trask, talking of the subject, says that Meigs had seen three cases, and Bedford four, distinctly traceable to this cause. Jolly found that ergot had been administered largely in 33 cases in which rupture occurred.

Premonitory Symptoms.—Some have believed that the impending occurrence of rupture could frequently be ascertained by peculiar premonitory symptoms, such as excessive and acute crampy pains about the lower part of the abdomen, due to the compression of part of the uterine walls. These are far too indefinite to be relied on, and it is certain that the rupture generally takes place without any symptoms that would have afforded reasonable grounds for suspicion.

General Symptoms.—The symptoms are often so distinct and alarming as to leave no doubt as to the nature of the case; not infrequently, however, especially if the laceration be partial, they are by no means so well marked, and the practitioner may be uncertain as to what has taken place. In the former class of cases a sudden excruciating pain is experienced in the abdomen, generally during the uterine contractions, accompanied by a feeling, on the part of the patient, of something having given way. In some cases this has been accompanied by an audible sound, which has been noticed by the bystanders. At the same time there is generally a considerable escape of blood from the vagina, and a prominent symptom is the sudden cessation of the previously strong pains. Alarming general symptoms soon develop, partly due to shock, partly to loss of blood, both external and internal. The face exhibits the greatest suffering, the skin becomes deadly cold and covered with a clammy sweat, and fainting, collapse, rapid feeble pulse, hurried breathing, vomiting, and all the usual signs of extreme exhaustion quickly follow.

Results of Abdominal and Vaginal Examinations.—Abdominal palpation and vaginal examination both afford characteristic indications in well-marked cases. If the child, as often happens, has escaped entirely, or in great part, into the abdominal cavity, it may be readily felt through the abdominal walls; while in the former case, the partially contracted uterus may be found separate from it in the form of a globular tumor, resembling the uterus after delivery. Per vaginam it may generally be ascertained that the presenting part has suddenly receded, and can no longer be made out; or some other part of the fœtus may be found in its place. If the rupture be extensive, it may be appreciable on vaginal examination, and, sometimes, a loop of intestine may be found protruding through the tear. Other occasional signs have been recorded, such as an emphysematous state of the lower part of the abdomen, resulting from the entrance of air into the cellular tissue; or the formation of a sanguineous tumor in the hypogastrium, or vagina. These are too uncommon, and too vague, to be of much diagnostic value.

Symptoms are somewhat Obscure.—Unfortunately the symptoms are by no means always so distinct, and cases occur in which most of the reliable indications, such as the sudden cessation of the pains, the external hemorrhage, and the retrocession of the presenting part, may be absent. In some cases, indeed, the symptoms have been so obscure that the real nature of the case has only been detected after death. It is rarely, however, that the occurrence of shock and prostration is not sufficiently distinct to arouse suspicion, even in the absence of the usual marked signs. In not a few cases distinct and regular contractions have gone on after laceration, and the child has even been born in the usual way. Of course, in such a case, mistake is very possible. So curious a circumstance is difficult of explanation. The most probable way of accounting for it is, that the laceration has not implicated the fundus of the uterus, which contracted sufficiently energetically to expel the fœtus. Hence it will be seen that the symptoms are occasionally obscure, and the practitioner must be careful not to overlook the occurrence of so serious an accident, because of the absence of the usual and characteristic symptoms.

Prognosis.—The prognosis is necessarily of the gravest possible character, but modern views as to treatment perhaps justify us in saying that it is not so absolutely hopeless as has been generally taught in our obstetric works. When we reflect on what has occurred—the profound nervous shock; the profuse hemorrhage, both external, and especially into the peritoneal cavity, where the blood coagulates and forms a foreign body; the passage of the uterine contents into the abdomen, with the inevitable result of inflammation and its consequences, if the patient survive the primary shock;—the enormous fatality need cause no surprise. Jolly has found that out of 580 cases 100 recovered, that is, in the proportion of 1 out of 6. This is a far more favorable result than we are generally led to anticipate; and as many of the recoveries happened in apparently the most desperate and unfavorable cases, we should learn the lesson that we need not abandon all hope, and should at least endeavor to rescue the patient from the terrible dangers to which she is exposed.

As regards the child the prognosis is almost necessarily fatal; and indeed, the cessation of the fœtal heart-sounds has been pointed out by McClintock as a sign of rupture in doubtful cases. The shock, the profuse hemorrhage, and the time that must necessarily elapse before the delivery of the child, are of themselves quite sufficient to explain the fact that the fœtus is almost always dead.

Treatment.—From what has been said of the impossibility of foretelling the occurrence of rupture, it must follow that no reliable prophylactic treatment can be adopted, beyond that which is a matter of general obstetric principle, viz., timely interference when the uterine contractions seem incapable of overcoming an obstacle to delivery, either on the part of the pelvis or fœtus.

Indications after Rupture has taken Place.—After rupture the main indications are to effect the removal of the child and the placenta, to rally the patient from the effects of the shock, and, if she survives so long, to combat the subsequent inflammation and its consequences. By far the most important point to decide is

*Selected Obst. Works, p. 385. †Op. cit., p. 38.

the best means to be adopted for the removal of the child; for it is admitted by all that the hopeless expectancy that was recommended by the older accoucheurs, or, in other words, allowing the patient to die without making any effort to save her, is quite inadmissible. If the fœtus be entirely within the uterine cavity, no doubt the proper course to pursue is to deliver at once *per vias naturales*, either by turning, by forceps, or by cephalotripsy. If any part other than the head present turning will be best, great care being taken to avoid further increase of the laceration. If the head be in the cavity or at the brim of the pelvis, and within easy reach of the forceps, it may be cautiously applied, the child being steadied by abdominal pressure, so as to facilitate its application. If there be, as is often the case, some slight amount of pelvic contraction, it may be preferable to perforate and apply the cephalotribe, so as to avoid any forcible attempts at extraction, which might unduly exhaust the already prostrate patient, and turn the scale against her. This will be the more allowable since the child is, as we have seen, almost always dead, and we might readily ascertain if it be so by auscultation.

Removal of the Placenta.—After delivery extreme care must be taken in removing the placenta, and for this it will be necessary to introduce the hand. The placenta will generally be in the uterus, for if the rent be not large enough for the child to pass through, it may be inferred that the placenta will not have done so either. If it has escaped from the uterus, very gentle traction on the cord may bring it within reach of the hand, and so the passage of the hand through the tear to search for it will be avoided.

Treatment when the Fœtus has Escaped out of the Uterus.—There can be but little doubt that, in the cases indicated, such is the proper treatment, and that which affords the mother the best chance. Unfortunately, the cases in which the child remains entirely in utero are comparatively uncommon, and generally it will have escaped into the abdomen, along with much extravasated blood. The usual plan of treatment recommended, under such circumstances, is to pass the hand through the fissure (some have even recommended that it should be enlarged by incision if necessary), to seize the feet of the fœtus, to drag it back through the torn uterus, and then to reintroduce the hand to search for and remove the placenta. Imagine what occurs during the process. The hand gropes blindly among the abdominal viscera, the forcible dragging back of the fœtus necessarily tears the uterus more and more, and, above all, the extravasated blood remains as a foreign body in the peritoneal cavity, and necessarily gives rise to the most serious consequences. It is surely hardly a matter of surprise that there is scarcely a single case on record of recovery after this procedure.

Reasons favoring Gastrotomy.—Of late years a strong feeling has existed that, whenever the child has entirely, or in great part, escaped into the abdominal cavity, the operation of gastrotomy affords the mother a far better chance of recovery; and it has now been performed in many cases with the most encouraging results. It is easy to see why the prospects of success are greater. The uterus being already torn, and the peritoneum opened, the only additional danger is the incision of the abdominal parietes, which gives us the opportunity of sponging out the peritoneal cavity, as in ovariotomy, and of removing all the extravasated blood, the retention of which so seriously adds to the dangers of the case. Another advantage is that, if the patient be excessively prostrate, the operation may be delayed until she has somewhat rallied from the effects of the shock, whereas delivery by the feet is generally resorted to as soon as the rupture is recognized, and when the patient is in the worst possible condition for interference of any kind.

Comparative Results of Various Methods of Treatment.—Jolly has carefully tabulated the results of the various methods of treatment, and, making every allowance for the unavoidable errors of statistics, it seems beyond all question that the results of gastrotomy are so greatly superior to those of other plans, that I think its adoption may fairly be laid down as a rule whenever the fœtus is no longer within the uterine cavity.

RESULTS OF VARIOUS METHODS OF TREATMENT AFTER RUPTURE OF UTERUS.

Treatment.	No. of cases.	Deaths.	Recoveries.	Per cent. of recoveries.
Expectation	144	142	2	1.45
Extraction *per vias naturales*	382	310	72	19
Gastrotomy	38	12	26	68.4

Of course this table will not justify the conclusion that 68 per cent. of the cases of ruptured uterus in which gastrotomy is performed will recover; but it may fairly be taken as proving that the chances of recovery are at least three or four times as great as when the more usual practice is adopted.

Necessity of Care in Performing the Operation.—It is perhaps needless to say that the operation must be performed with the same minute care that has raised ovariotomy to its present pitch of perfection, and that especial attention should be paid to the sponging out of the peritoneum, and the removal of foreign matters.

Recapitulation.—To recapitulate, I think what has been said justifies the following rules of treatment after rupture:—

1. If the head or presenting part be above the brim, and the fœtus still in utero—forceps, turning, or cephalotripsy, according to circumstances.

2. If the head be in the pelvic cavity—forceps or cephalotripsy.

3. If the fœtus have wholly, or in great part, escaped into the abdominal cavity—gastrotomy.

Subsequent Treatment.—As to the subsequent treatment little need be said, since in this we must be guided by general principles. The chief indication will be to remove shock and rally the patient by stimulants, etc., and to combat secondary results by opiates and other appropriate remedies.

Lacerations of the vagina occasionally take place, and in the great majority of cases they are produced by instruments, either from a want of care in their introduction, or from undue stretching of the vaginal walls during extraction with the forceps. Slight vaginal lacerations are probably much more common after forceps delivery than is generally believed to be the case. As a rule, they are productive of no permanent injury, although it must not be forgotten that every breach of continuity increases the risk of subsequent septic absorption. When the laceration is sufficiently deep to tear through the recto-vaginal septum, or the anterior vaginal wall, the passage of the urine or feces is apt to prevent its edges uniting; then that most distressing condition, recto-vaginal, or vesico-vaginal fistula is established.

It must not be supposed that fistulæ are often the result of injury during operative interference. That is a common but very erroneous opinion both among the profession and the public. In the vast majority of cases the fistulous opening is the consequence of a slough resulting from inflammation, produced by long-continued pressure of the vaginal walls between the child's head and the bony pelvis, in cases in which the second stage has been allowed to go on too long. In most of these cases instruments were doubtless eventually used, and they get the blame of the accident; whereas the fault lay, not in their being employed, but rather in their not having been used soon enough to prevent the contusion and inflammation which ended in sloughing.

When vesico-vaginal fistulæ are the result of lacerations during labor, the urine must escape at once, but this is rarely the case. In the large majority of cases the urine does not pass per vaginam until more than a week after delivery, showing that a lapse of time is necessary for inflammatory action to lead to sloughing. In order to throw some light on these points, on which very erroneous views have been held, I have carefully examined the histories, from various sources, of 63 cases of vesico-vaginal fistula.

1st. In 20 no instruments were employed. Of these, there were

in labor under 24 hours	. . . .	2
from 24 to 48 hours	. .	8*
" 48 to 70 "	. .	2
" 70 to 80 "	. .	7
" 80 hours and upwards	.	1 Total, 20

*But of these in 7 no precise time is stated. 6 of them are marked *very tedious*, therefore they probably exceeded the limit.

Therefore out of these 20 cases one-half were certainly more than 48 hours in labor, and 6 of the remaining 10 were probably so also. In only 1 of them is the urine stated to have escaped per vaginam immediately after delivery. In 7 it is said to have done so within a week, and in the remainder after the seventh day.

2d. In 34 cases instruments were used, but there is no evidence of their having produced the accident. Of these, there were in labor under 24 hours 2

from 24 to 48 hours	8	
" 48 to 72 "	10	
" 72 hours and upwards	14	Total, 34

The urine escaped within 24 hours in 2 cases only, within a week in 16, and after the seventh day in 15.

So that here again we have the history of unduly protracted delivery, 24 out of the 34 having been certainly more than 48 hours in labor.

3d. In 9 cases the histories show that the production of the fistula may fairly be ascribed to the unskilled use of instruments. Of these, there were in labor under 24 hours . 7

from 24 to 48 hours	1	
" 48 to 72 "	1	Total, 9

The urine escaped at once in 7 cases, and in the remaining 2 after the seventh day.

These statistics seem to me to prove, in the clearest manner, that, in the large majority of cases, this unhappy accident may be directly traced to the bad practice of allowing labor to drag on many hours in the second stage without assistance, and not to premature instrumental interference. This question has recently been elaborately studied by Emmet, who gives numerous statistical tables which fully corroborate these views. His conclusion, the result of much practical experience of vesico-vaginal fistulæ, is worthy of being quoted: "I do not hesitate," he says, "to make the statement that I have never met with a case of vesico-vaginal fistula which, without doubt, could be shown to have resulted from instrumental delivery. On the contrary, the entire weight of evidence is conclusive in showing that the injury is a consequence of delay in delivery."*

Treatment.—As to the treatment of vaginal laceration little can be said. In the slighter cases vaginal injections of diluted Condy's fluid will be useful to lessen the risk of septic absorption; and the graver, when vesico-vaginal or recto-vaginal fistulæ have actually formed, are not within the domain of the obstetrician, but must be treated surgically at some future date.

SECTION XVII.

INVERSION OF THE UTERUS.

Inversion of the uterus shortly after the birth of the child is one of the most formidable accidents of parturition, leading to symptoms of the greatest urgency, not rarely proving fatal, and requiring prompt and skilful treatment. Hence it has obtained an unusual amount of attention, and there are few obstetric subjects which have been more carefully studied.

An Accident of Great Rarity.—Fortunately, the accident is of great rarity. It was only observed once in upwards of 190,800 deliveries at the Rotunda Hospital since its foundation in 1745; and many practitioners have conducted large midwifery practices for a lifetime without ever having witnessed a case. It is none the less needful, however, that we should be thoroughly acquainted with its natural history, and with the best means of dealing with the emergency when it arises.

Division into Acute and Chronic Forms.—Inversion of the uterus may be met with in the acute or chronic form; that is to say, it may come under observation either immediately or shortly after its occurrence, or not until after a considerable lapse of time, when the involution following pregnancy has been completed. The latter falls more properly under the province of the gynæcologist, and involves the consideration of many points that would be out of place in a work on obstetrics. Here, therefore, the acute form alone is considered.

Description of Inversion.—Inversion consists essentially in the enlarged and empty uterus being turned inside out, either partially or entirely; and this may occur in various degrees, three of which are usually described, and are practically useful to bear in mind. In the first and slightest degree there is merely a cup-shaped depression of the fundus (Fig. 96); in the second the depression is greater, so that the inverted portion forms an introsusception, as it were, and projects downwards through the os in the form of a round ball, not unlike the body of a polypus, for which, indeed, a careless observer might mistake it; and, thirdly, there is the complete variety, in which the whole organ is turned inside out and may even project beyond the vulva.

Fig. 96.

Partial Inversion of the Fundus. (From a preparation in the museum of Guy's Hospital.)

Its Symptoms.—The symptoms are generally very characteristic, although, when the amount of inversion is small, they may entirely escape observation. They are chiefly those of profound nervous shock, viz., fainting, small, rapid, and feeble pulse, possibly convulsions and vomiting, and a cold, clammy skin. Occasionally severe abdominal pain, and cramp and bearing down are felt. Hemorrhage is a frequent accompaniment, sometimes to a very alarming extent, especially if the placenta be partially or entirely detached. The loss of blood depends to a great extent on the condition of the uterine parietes. If there be much contraction of the part that is not inverted, the introsuscepted part may be sufficiently compressed to prevent any great loss. If the entire organ be in a state of relaxation, the loss may be excessive.

Results of Physical Examination.—The occurrence of such symptoms shortly after delivery would of necessity lead to an accurate examination, when the nature of the case may be at once ascertained. On passing the finger into the vagina, we either find the entire uterus forming a globular mass, to which the placenta is often attached; or, if the inversion be incomplete, the vagina is occupied by a firm, round, and tender swelling, which can be traced upwards through the os uteri. The hand placed on the abdomen will detect the absence of the round ball of the contracted uterus, and bi-manual examination may even enable us to feel the cup-shaped depression at the site of inversion.

Differential Diagnosis.—When such signs are observed immediately after delivery, mistake is hardly possible. Numerous instances, however, are recorded in which the existence of inversion was not immediately detected, and the tumor formed by it only observed after the lapse of several days, or even longer, when the general symptoms led to vaginal examination. It is probable that, in such cases, a partial inversion had taken place shortly after delivery, which, as time elapsed, became gradually converted into the more complete variety. In a case of this kind, as in a chronic inversion, some care is necessary to distinguish the inversion from a uterine polypus, which it closely resembles. The cautious insertion of the sound will render the diagnosis certain, since its passage is soon arrested in inversion, while, if the tumor be polypoid, it readily passes in as far as the fundus.

Manner in which Inversion is Produced.—The mechanism by which inversion is produced is well worthy of study, and has given rise to much difference of opinion.

Occasionally Produced by Accidental Mechanical Causes.—A very

*The Principles and Practice of Gynæcology, p. 669.

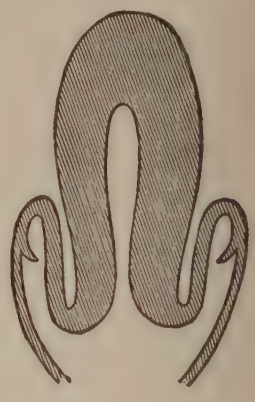
general theory is that it is caused, in many cases, by mismanagement of the third stage of labor, either by traction on the cord, the placenta being still adherent, or by improperly applied pressure on the fundus; the result of both these errors being a cup-shaped depression of the fundus, which is subsequently converted into a more complete variety of inversion. That such causes may suffice to start the inversion cannot be doubted, but it is probable that their frequency has been much exaggerated. Still there are numerous recorded cases in which the commencement of the inversion can be traced to them. Improperly applied pressure (as when the whole body of the uterus is not grasped in the hollow of the hand, but when a monthly nurse, or other uninstructed person, presses on the lower part of the abdomen, so as simply to push down the uterus *en masse*) is often mentioned in histories of the accident. Thus in the "Edinburgh Medical Journal" for June, 1848, a case is related in which the patient would not have a medical man, but was attended by a midwife, who, after the birth of the child, pulled on the cord, while the patient herself clasped her hands and pushed down her abdomen, at the same time straining forcibly, when the uterus became inverted and the patient died of hemorrhage before assistance could be procured. Here both of the mechanical causes mentioned were in operation. In several cases it is mentioned that the accident occurred while the nurse was compressing the abdomen. That the accident is practically impossible when firm and equable contraction has taken place, cannot be questioned. Hence it is of paramount importance that the practitioner should himself carefully attend to the conduct of the third stage of labor.

Often Occurs Spontaneously.—In a large proportion of cases no mechanical causes can be traced, and the occurrence of spontaneous inversion must be admitted. There are various theories held as to how this occurs. Partial and irregular contraction of the uterus is generally admitted to be an important factor in its production; but it is still a matter of dispute whether the inversion is produced mainly by an active contraction of the fundus and body of the uterus, the lower portion and cervix being in a state of relaxation —or whether the precise reverse of this exists, the fundus being relaxed and in a state of quasi-paralysis, while the cervix and lower portion of the uterus are irregularly contracted. The former is the view maintained by Radford and Tyler Smith, while the latter is upheld by Matthews Duncan.

Evidence in Favor of Duncan's Theory.—There are good clinical reasons for believing that Duncan's view more nearly corresponds with the true facts of the case; for, if the fundus and body of the uterus be really in a state of active contraction, while the cervix is relaxed, we have, as Duncan points out, the very condition which is normal and desirable after delivery, and that which we do our best to produce. If, however, the opposite condition exist, and the fundus be relaxed, while the lower portion is spasmodically contracted, a state exists closely allied to the so-called hour-glass contraction. Supposing now any cause produces a partial depression of the fundus, it is easy to understand how it may be grasped by the contracted portion, and carried more and more down, in the manner of an introsusception, until complete inversion results. That such partial paralysis of the uterine walls often exists, especially about the placental site, was long ago pointed out by Rokitansky, and other pathologists. This theory supposes the original partial depression and relaxation of the fundus. How this is often produced by mismanagement of the third stage has already been pointed out; but, even in the absence of such causes, it may result from strong bearing-down efforts on the part of the patient, or, as Duncan holds, from the absence of the retentive power of the abdomen. Indeed, the incompatibility of an actively contracted state of the fundus with the partial depression, which is essential, according to both views, for the production of inversion, is the strongest argument in favor of Duncan's theory.

Taylor's Theory.—A totally different view has more recently been sustained by Dr. Taylor, of New York, who maintains that "spontaneous active inversion of the uterus rests upon prolonged natural and energetic action of the body and fundus; the cervix, the lower part, yielding first, is thus rolled out, or everted, or doubled up, as there is no obstruction from the contractility of the cervix, which is at rest or functionally paralyzed—the body is gradually, sometimes instantaneously, forced lower and lower, or inverted."* That partial inversion may commence at the cervix was pointed out by Duncan in his paper, who depicts it in the accompanying diagram (Fig. 97), and states it to be of not unfrequent occurrence. It is not impossible that occasionally such a state of things should be carried on to complete inversion. But there are serious objections to the acceptance of Dr. Taylor's view that such is the principal cause of inversion, since the process above described would be of necessity a slow and long-continued one, whereas nothing is more certain than that inversion is generally sudden and accompanied by acute symptoms of shock, and is often attended by severe hemorrhage, which could not occur when such excessive contraction was taking place.

Fig. 97.



Illustrating the Commencement of Inversion at the Cervix. (After Duncan.)

Treatment.—The treatment of inversion consists in restoring the organ to its natural condition as soon as possible. Every moment's delay only serves to render restoration more difficult, as the inverted portion becomes swollen and strangulated; whereas if the attempt at reposition be made immediately, there is generally comparatively little difficulty in effecting it. Therefore it is of the utmost importance that no time should be lost, and that we should not overlook a partial or incomplete inversion. Hence the occurrence of any unusual shock, pain, or hemorrhage after delivery, without any readily ascertained cause, should always lead to a careful vaginal examination. A want of attention to this rule has too often resulted in the existence of partial inversion being overlooked, until its reduction was found to be difficult or impossible.

Mode of Attempting Reduction.—In attempting to reduce a recent inversion, the inverted portion of the uterus should be grasped in the hollow of the hand and pushed gently and firmly upwards into its natural position, great care being taken to apply the pressure in the proper axis of the pelvis, and to use counter-pressure, by the left hand, on the abdominal walls. Barnes lays stress on the importance of directing the pressure towards one side, so as to avoid the promontory of the sacrum. The common plan of endeavoring to push back the fundus first has been well shown by McClintock† to have the disadvantage of increasing the bulk of the mass that has to be reduced, and he advises that, while the fundus is lessened in size by compression, we should, at the same time, endeavor to push up first the part that was less inverted, that is to say, the portion nearest the os uteri. Should this be found impossible, some assistance may be derived from the manœuvre, recommended by Merriman and others, of first endeavoring to push up one side or wall of the uterus, and then the other, alternating the upward pressure from one side to the other as we advance. It often happens as the hand is thus applied, that the uterus somewhat suddenly reinverts itself, sometimes with an audible noise, much as an India-rubber bottle would do under similar circumstances. When reposition has taken place the hands should be kept for some time in the uterine cavity to excite tonic contraction; or Barnes' suggestion of injecting a weak solution of perchloride of iron may be adopted, so as to constrict the uterine walls, and prevent a recurrence of the accident.

It is hardly necessary to point out how much these manœuvres will be facilitated by placing the patient fully under the influence of an anæsthetic.

Management of the Placenta.—There has been much difference

*New York Med. Journ., 1872. †Diseases of Women, p. 79.

of opinion as to the management of the placenta in cases in which it is still attached when inversion occurs. Should we remove it before attempting reposition, or should we first endeavor to reinvert the organ, and subsequently remove the placenta? The removal of the placenta certainly much diminishes the bulk of the inverted portion, and, therefore, renders reposition easier. On the other hand, if there be much hemorrhage, as is so frequently the case, the removal of the placenta may materially increase the loss of blood. For this reason, most authorities recommend that an endeavor should be made at reduction before peeling off the afterbirth. But if any delay or difficulty be experienced from the increased bulk, no time should be lost, and it is in every way better to remove the placenta and endeavor to reinvert the organ as soon as possible.

Management of Cases Detected some Time after Delivery.—Supposing we meet with a case in which the existence of inversion has been overlooked for days, or even for a week or two, the same procedure must be adopted; but the difficulties are much greater, and the longer the delay, the greater they are likely to be. Even now, however, a well-conducted attempt at taxis is likely to succeed. Should it fail, we must endeavor to overcome the difficulty by continuous pressure applied by means of caoutchouc bags, distended with water, and left in the vagina. It is rarely that this will fail in a comparatively recent case, and such only are now under consideration. It is likely that by pressure, applied in this way for twenty-four or forty-eight hours, and then followed by taxis, any case detected before the involution of the uterus is completed may be successfully treated.

CHAPTER XVI.

OBSTETRIC OPERATIONS.—*LEISHMAN.*

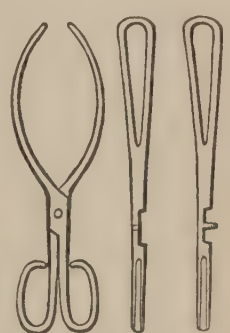
The subject of operative Midwifery naturally commences by a consideration of the great Prime Mover of Obstetrics, as the Forceps has not inaptly been termed. It is scarcely possible to exaggerate the importance of this instrument, which is simple in construction, easy of application, and marvellous in power; and, besides, the greater frequency with which we avail ourselves of its aid, as compared with other methods of instrumental and operative assistance, fully entitles it, and its application in practice, to the prominent position in which the subject is invariably placed.

No doubt can be entertained that the ancients discovered, and were in the habit of using, an instrument which, in the principle of its construction, is identical with the modern forceps. The period at which the discovery was actually made will probably never be known. It does not appear that the knowledge of the subject was general, even among the most civilized communities, but it is certain that it was well known to the early Arabian physicians. We thus find it mentioned by Avicenna, and more particularly described by Albucasis, who lived about the eleventh or twelfth century. The latter describes two kinds of forceps, the *misdach* and the *almisdach*, both being, according to the Latin version, circular and full of teeth. It is worthy of note that, in the Arab original, which Smellie seems to have seen in the Bodleian library at Oxford, the *misdach* is described as straight, and the *almisdach* as curved. This important discovery was, however, completely lost sight of in the gloom of the dark ages, nor was it till near the middle of the seventeenth century that it was rediscovered, and, after a long interval of secrecy, introduced into practice.

This discovery, which was made prior to 1647, has been generally attributed to Dr. Paul Chamberlen, but the careful researches of Dr. Aveling,* have clearly shown that we owe it to Dr. Peter Chamberlen, who communicated it to his sons Hugh, Paul, and another, all members of the profession. The secret seems, however, to have been greedily guarded by the Chamberlen family for their own profit; and Dr. Hugh Chamberlen, who translated into English Mauriceau's work on Midwifery, alludes to it in the preface to that work as late as 1716. Referring to the use of the crotchet, he says, "but I can neither approve of that practice, nor of those delays, beyond twenty-four hours, because my father, brothers, and myself (though none else in Europe, as I know) have, by God's blessing and our industry, attained to, and long practised a way to deliver women in this case without any prejudice to them or their infants; though all others (being obliged, for want of such an expedient, to use the common way) do and must endanger, if not destroy, one or both, with hooks." As a sort of apology for keeping it secret, he adds, "there being my father and two brothers living that practise this art, I cannot esteem it my own to dispose of nor publish it without injury to them."

The political troubles of his time obliged Dr. Hugh Chamberlen, on two occasions at least, to fly the country and take refuge on the Continent, where he made various attempts to dispose of his invention. His offer to sell it to the French Government was refused, chiefly on account of the failure which had attended his efforts to deliver a woman upon whom Mauriceau had resolved to perform the Cæsarean operation, and which was therefore a case, as we may assume, quite unsuitable for the operation by the forceps. He was more successful, however, in Holland, where he managed to dispose of his secret to several practitioners, of whom Ruysch, the eminent anatomist, was one. From the Netherlands to Germany, where it was used by Solingen, and ultimately to France, the secret slowly spread, until it was a secret no longer, and was recognized in all its importance by the most accomplished accoucheurs of the day.

Fig. 98.



Sketch of Chamberlen's Forceps. (Rigby.)

Long before the operation had thus made its way into notice on the Continent, the secret in this country had undoubtedly oozed out in some quarter; and, ultimately, the midwifery forceps was described and figured by Chapman, in his well-known work, as the instrument used by the Chamberlens. A very interesting discovery was made in the old manor-house of a small estate near Malden, in Essex, which had been purchased by Dr. Peter Chamberlen towards the end of the seventeenth century, and which had remained in the family till about 1715. In an old chest in one of the rooms of this house, there was discovered, in 1818, a collection of obstetric instruments, along with old coins, trinkets, and the like. Mr. Cansardine, into whose possession these relics had fallen, gave an interesting description of them in the *Medico-Chirurgical Transactions*, Vol. IX. There were several pairs of forceps, showing apparently the various stages of advancement through which the invention passed in Chamberlen's hands before he reached what he believed to be perfection. Fig. 98 shows one of the most perfect of these, in which the blades are fenestrated, and are so constructed as, when separately applied, to be articulated together at the shank

* Obstetrical Journal of Great Britain and Ireland—January, 1875.

by means of a pivot. This instrument, as perfected by Giffard and Chapman, is essentially the same as the forceps most frequently used at the present day, except in so far as the lock is concerned.

Up to this time the handles of all the instruments were, as in the French forceps to the present day, of iron, and the lock was either a pivot, with or without a screw; a sort of mortise-lock, like the blades of a pair of scissors; or the blades were clumsily tied together, after their adjustment, by means of a tape or cord. We are certainly indebted to Smellie for the simple contrivance which is known as the English lock, and also for the adaptation of wooden handles, which give a much better hold and purchase. The principle upon which all forceps were essentially constructed was to adjust the curve of the blades with reference only to the spheroidal shape of the child's head, so as to make sure of securing an efficient hold without risk to the child. The difficulty in the application of such an instrument as this, when the head was at the brim or at the upper part of the cavity, led to another important modification of the forceps, the credit of which is divided between Levret and Smellie. It is most likely, however, that the French obstetrician was the real inventor; but it is to be regretted, for the sake of his reputation, that he made a secret of it, as the Chamberlens, to their lasting discredit, had done before.

The novelty in question consisted in the adaptation of a second curve in the blades, with reference, in this instance, to the curved axis of the pelvic canal. This is called the "pelvic curve," and is the invariable form of the French forceps of the present day; while, in this country also, the straight forceps has been entirely abandoned by some of the most eminent of our obstetrical authorities. This variety was originally constructed in order to overcome difficulties at the brim and high in the cavity; and it is, therefore, to these that it is chiefly applicable; although as has been said, many prefer this form in all cases, and allege that it is easier in application, and safer both to mother and child. We do not intend to enter at any length upon the controversy of single *versus* double-curved forceps; but it is proper to mention that Dr. Barnes, the latest English authority on the subject of operative midwifery, pronounces, in very emphatic terms, in favor of the latter, in all cases, whether at the brim, in the cavity, or at the outlet. For our part, although we cannot subscribe to this doctrine, we are quite confident as to the superiority of the pelvic curve in all cases where the head is at the brim or high in the cavity.

Long and Short Forceps are described by all English writers as distinct varieties of the instrument, and are sold by the makers under these names. The Short Forceps, as usually constructed, is an instrument about 11 inches in length, the measurement from the lock to the tip of the blades being a little over seven inches. Each blade is fenestrated, the aperture being destined, on each side, to receive the parietal protuberances. The blades are curved, so as to measure between their widest part about three inches, and from tip to tip, when closed, not more than an inch. This instrument, when made without a pelvic curve, is known as Smellie's forceps, and is still used to a considerable extent in this country. When it is applied to the child's head within the pelvis, the handles should be about an inch apart. It is scarcely necessary to observe, what is equally applicable to any variety of forceps, that the blades should be made of steel of the finest temper; otherwise, they are constantly apt to slip over the head by yielding of the metal. The edges are highly polished, and bevelled off in every direction with great care, so as to avoid the possibility of injuring the scalp of the child or the soft parts of the mother. Covering the blades with leather was once practised, but this has now properly fallen into disuse, as rendering the instrument more difficult of introduction, and more likely to convey infection. Nor is the practice of covering them with a composition of gutta-percha to be commended; and when properly made, the clean, smooth metal is, on all accounts, to be preferred. The short forceps is suitable for the extraction of the head from the outlet and lower part of the pelvis; but if the head is higher in the cavity, this instrument, although it may still be used with difficulty, is not to be recommended when one more efficient is at hand. Its use should be limited to those instances in which it is possible, after adjusting the blades, to close them when the lock is still quite clear of the external parts. If the lock passes within the vulva, there is considerable danger—especially when the woman is under the influence of anæsthetics, and is thus unable to give any evidence of particular suffering—of pinching in some portion of the soft parts, and inflicting serious laceration.

To obviate this risk, and at the same time to render the forceps capable of more extended application, we have always advocated the employment, in ordinary practice, of an instrument which is both longer and stronger than the ordinary short forceps. Such an instrument as this, which fulfils equally well all the purposes of the short forceps, is also applicable to cases in which the head occupies the middle third of the cavity, or is even a little higher. In these latter cases, the lock is still external, and the power of the instrument is considerably increased. The handles are stronger, and the blades thicker, than in the ordinary short instrument; for it is a fundamental rule, in the construction of the midwifery forceps, that, for obvious mechanical reasons, we must increase the strength in proportion to the length of the blades. And, in doing so, it is also proper so to construct the handles as to give the operator sufficient power; as no greater error can be committed than to sacrifice power to elegance, or to a dislike to give the instrument a formidable appearance. The following remarks by Dr. Barnes are so apposite to this, that we quote them here. "It has been sought," he says, "to make an instrument safe by making it weak. There can be no greater fallacy. In the first place, a weak instrument is, by the mere fact of its weakness, restricted to a very limited class of cases. In the second place, if the instrument is weak it calls for muscular force on the part of the operator. Now, it is sometimes necessary to keep up a considerable degree of force for some time, and not seldom in a constrained position. Fatigue follows; the operator's muscles become unsteady; the hand loses its delicacy of diagnostic touch, and that exactly-balanced control over its movements which it is all-important to preserve. Under these circumstances, he is apt to come to a premature conclusion, that he has used all the force that is justifiable; that the case is not fitted for the forceps, and takes up the horrid perforator; or he runs the risk of doing that mischief to avoid which his forceps was made weak. The faculty of accurate gradation of power depends upon having a reserve of power. Violence is the result of struggling feebleness, not of conscious power. Moderation must emanate from the will of the operator; it must not be looked for in the imperfection of his instruments. The true use of a two-handed forceps is to enable one hand to assist, to relieve, to steady the other. By alternate action the hands get rest, the muscles preserve their tone, and the accurate sense of resistance which tells him the minimum degree of force that is necessary, and warns him when to desist."

It is, perhaps, natural that an operator should prefer that form of forceps to the use of which he has been trained, and upon which he knows, by experience, that he can thoroughly depend in times of danger or difficulty. In confessing, however, a personal predilection for the straight forceps, it is proper to observe that many of the most experienced and distinguished practitioners, both in this country and abroad, express a decided preference for the pelvic curve. Personal experience, which is corroborated by that of many able and experienced accoucheurs, prevents us from perceiving the strength of their arguments, or the justice of their conclusions; and we object more particularly to the assertion that the straight forceps is specially dangerous to the child. It may well be that the pelvic curve in the hands of those skilled in its use is equally efficient. That it is so, cannot, indeed, be doubted, and it is possible that, when once adjusted, the danger of slipping is less when used by the inexperienced, but we conceive that such problematical advantages are more than counterbalanced by the following: First, the blades are more easily introduced, with reference to the position of the child's head, if the operator has but one curve to think of; second, the two blades being the same, no mistake can possibly be made between the upper and lower, or ante-

rior and posterior blade; and third, that if it should be found necessary to alter the position of the head by rotation, this can only be effected by the straight instrument.

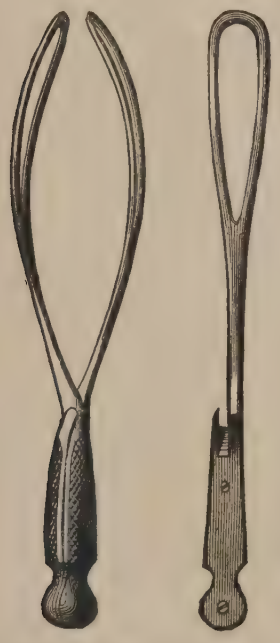
The forceps, the use of which we recommend to young practitioners, who generally possess but one instrument, is of a size intermediate between the short forceps and what will presently be described as the long forceps. (See Fig. 99.) It is, as already mentioned, applicable for all the purposes of the short forceps, but by means of it we are able to operate quite as easily when the great diameters of the head are on a level with the middle plane of the pelvis. It is fourteen inches in length, the blades to the lock being nine, and the handles five inches. The fenestræ are four and a half inches in length, and something less than an inch and a quarter in the widest part. The distance between the blades in the widest part of the curve is three inches, and at the tips a little under an inch. The handles are lengthened to secure a better hold.

[The forceps that we have used with entire satisfaction for the past twenty years is the instrument of the late Prof. Hodge.

The fact that obstetricians are very fond of connecting their names with this important instrument by unimportant changes in it, has given us a great variety to select from, but the forceps of Prof. Hodge, which is a great improvement upon the clumsy French instrument, and from the fact that it can be so readily used in any part of the pelvic canal, is the instrument in general use in this country.

Fig. 100 is a cut of the Hodge forceps, which is too well known to require any further description.—G.]

Fig. 99.



Straight Forceps for ordinary use.

Fig. 100.

Hodge's Forceps.

Cases requiring the use of the forceps are very variable in their general features, but most of them may be referred to one or other of the following groups. We may have, in the first instance, cases in which everything is normal save expulsive power, which may utterly fail as the period of delivery approaches: this failure of the *vis à tergo* is familiarly known as "uterine inertia," and from it arises, more frequently than from any other cause, the necessity for operative assistance. In another group, the operation is rendered necessary by a minor degree of pelvic deformity, at the outlet or in the cavity—of which flattening of the sacrum is an example, probably of more frequent occurrence than is usually supposed. The application of the forceps, when the head is at or above the brim, is less frequently required, and is attended with special difficulties and dangers which will be duly considered. Any mechanical obstruction, however, whether of the hard or soft parts, including the abnormal rigidity of any portion of the parturient canal, may be an unmistakable warrant for operative assistance. In occipito-posterior positions, and in face presentation, the forceps may be found necessary either for rectification or direct extraction; and in convulsions, or any condition calling for speedy delivery, it may also be necessary to use the forceps if the labor has sufficiently advanced to admit of the safe application of the instrument. Some of the rarer circumstances calling for the forceps have already been mentioned, such as certain exceptional cases of rupture of the uterus, placenta prævia, or funis presentation. In cases of breech presentation, or after turning, it is frequently necessary to apply the forceps, when the trunk has been born, in order to extract the head from the soft parts and protect the child from suffocation. The instrument, being specially constructed for application over the spheroidal cranium, is only applicable, as is evident, to a limited class of cases. For other presentations, which may require operative assistance, special mechanical aids must be sought. The necessity for operation by the forceps arises more frequently in primiparæ than in women who have already borne children.

Application of the Forceps.—Before, in any case, making the slightest attempt in this direction, we must be sure that neither the bladder nor rectum is distended, and this caution is especially required as regards the bladder, from which the contents must, if necessary, be withdrawn by the catheter. An essential condition is, according to all authorities, complete dilatation of the os, but some difficulty unfortunately seems to exist in determining what we are to understand by "complete dilatation." The cases which are undoubtedly most favorable for operation are those in which the os is absolutely obliterated or drawn up beyond the reach of the operator over the advancing head. But if we limit the employment of the instrument to these cases alone, we shall certainly withhold assistance in many in which we might deliver the woman with perfect safety. Obliteration of the os, or actual continuity of the uterine with the vaginal canal, is no doubt desirable, but we must not admit as true the statements of those who tell us that it is essential to safety. To wait until the lip of the os can no longer be felt, as some have said, is to wait for what may possibly never occur; and, in like manner, if we accept the rule as correct, that we are never to pass the blades of the forceps within the uterus, we may allow the period to pass at which we may, by prompt action, save the life of the child.

Complete dilatation of the os is, indeed, in a sense, absolutely essential, and it is certain that a greater degree of dilatation is necessary for this than for any other of the operations for delivery. But complete dilatation, in the sense which we would attach to the term, does not imply that the anterior lip of the os has passed out of reach beyond the head, but merely such dilatation as will admit of the safe passage of the head. In many cases, then, we are justified in passing the blades partly within the uterus; and, although it is quite proper to wait as a rule for what we call complete dilatation, all that is absolutely essential is such dilatation as may admit of the passage and adjustment of the blades without danger of laceration. There can be no doubt that, in a considerable number of cases, recession or retraction of the os, and especially of its anterior lip, does not occur immediately upon full dilatation, nor, it may be, for a considerable period thereafter.

The possibility of feeling an ear has been very generally looked upon as important and, by some, as an essential condition, in the absence of which we would never be justified in operating. That the ear may often be reached with ease, when the other operative conditions are fulfilled, is undoubted; and, in cases in which we are only called in when a large caput succedaneum has in some measure obliterated the landmarks on the surface of the cranium, it is really important that we should seek for and observe the ear, with the view of determining the exact position of the head. But to accept this as a rule for our guidance in every case, is both unnecessary and improper, as the ear, in some cases in which we may hold the operation to be perfectly justifiable, can only be reached

with difficulty, or with an amount of violence which may greatly aggravate the sufferings of the patient.

The forceps must be applied directly to the surface of the child's head, and it is therefore absolutely necessary that the membranes be ruptured, should this not have already spontaneously occurred. We have been summoned with a view to delivery by the forceps in a case in which it was stated that the os was fully dilated, although it turned out that the os was still very slightly dilated and only reached with difficulty in the posterior part of the pelvis, the thin uterine wall being still extended over the surface of the scalp. Such a condition could, with ordinary care, scarcely lead to an error in practice, but the possibility of a mistake should nevertheless be borne in mind by the inexperienced.

If possible, but with exceptions to be afterwards noticed, the blades should be applied to the sides of the child's head. To do this with accuracy, it is necessary that the actual position of the head be made out with perfect certainty. This may be ascertained, as has been explained in a former chapter, by a careful examination of the sutures and fontanelles, and of the relation which these parts bear to the pelvic canal; and, as there are four possible cranial positions, we must first be sure with which of them we have to deal, before we take the instrument into our hands. It is only, as we have said, when exceptional difficulties exist that we require to examine the ear. No one, therefore, is qualified to attempt delivery by the forceps unless he is familiar with the laws which regulate normal parturition; and there is, in fact, no operation or contingency in midwifery practice, in which a thorough knowledge of the mechanism of labor, in all its details, is so essential as this. It is unnecessary to inform any one familiar with the details of normal parturition, that the method of application will depend upon the situation of the head. In proportion to the proximity of the head to the external parts, the movement of rotation will be found, in the ordinary position, to have occurred; and, therefore, the nearer it is to the outlet, the more do we require to apply the blades in the transverse diameter of the pelvis, in our endeavor to adjust them to the sides of the head. When, however, the head is higher, its position is more decidedly oblique, and, even at the outlet, a little of this obliquity still obtains; so that, to insure their application to the sides of the head, we must apply them *in the opposite oblique diameter to that in which the child's head lies.*

Having satisfied ourselves as to the position of the head, and that the conditions exist which warrant the performance of the operation, we prepare the forceps by warming and greasing the blades. The patient, who lies in the ordinary midwifery position, should be carried quite to the edge of the bed, so that her hips may even project a little over it, and it is advisable that she should be brought, before commencing the operation, into a state of full anæsthesia. We should be perfectly satisfied with her posture before commencing the operation, as a change in this respect after one blade has been introduced is not free from risk. If the head is at the outlet and resting on the perineum, the blades are to be introduced, so that the handles shall be directed *forwards* under the pubic arch; if rotation has not yet occurred, and the head is consequently in the lower part of the cavity, they will, with reference to the erect posture, be directed *downwards;* and, if the head is higher in the pelvis, they will be directed more or less *backwards* towards the perineum. If, however, it is still high in the pelvis, or at the brim, we should use the double-curved long forceps; for, our object being to apply extracting force in the axis of that part of the pelvis which the head occupies, we must discard the straight forceps if we find that the shanks of the blades press upon the fourchette. This we do for various reasons, to be afterwards more particularly explained in connection with the subject of the double-curved forceps, not the least of which is the danger to the integrity of the perineal tissues which would accrue in an attempt to pull the head backwards in a direction even approaching to the axis of the brim.

Let us suppose the head to be in the position which in seventy per cent. of cranial presentations it occupies,—in the right oblique diameter, with the forehead towards the right sacro-iliac synchondrosis, and the occiput to the left foramen ovale. The blades, in this case, are to be passed in the direction of the left sacro-iliac synchondrosis and the right foramen ovale, or, in other words, to the poles of the left oblique diameter of the pelvis. With reference to the position of the woman as she lies on her left side, we speak of the "upper" and "lower" blades. It is of no great importance which of these blades is first introduced, but it is proper that the operator should have a definite plan of procedure, which

Fig. 101.

Introduction of the Lower Blade.

he may adopt in every case. If he introduce, as we are in the habit of doing, the lower blade first, he grasps one of the blades with the fingers of his right hand as he would a catheter, and holds it for a moment diagonally across the breech of the woman, with the concavity of the blade turned towards her, the point downwards and to the left, the handle upwards and to the right. If thus held, it will correspond to the left oblique diameter, and from this it should not deviate or twist in any way during its introduction. Two or three fingers of the left hand, which have been duly anointed, are then to be passed into the vagina, over the left ischial tuberosity, in the direction of the corresponding sacro-sciatic ligaments, with the palmar surface upwards, until the head is reached. The blade is then passed along the fingers, and, if the os is still distinguishable, it is to be carefully guided within it. If the handle is now gradually depressed, and at the same time gently pushed onwards, it will generally glide over the convex surface of the cranium without the slightest difficulty or danger. Should the blade turn or twist in the direction either of the hollow of the sacrum or of the foramen ovale, it is on no account to be replaced forcibly, but is to be partially withdrawn by raising the handle, and reintroduced with greater care. The handle is then carried towards the perineum, and intrusted to an assistant while the introduction of the upper blade is being effected.

The operator should take the second blade with his left hand, so that it diagonally crosses the breech as before, but with the point above and to the right, and the handle downwards, and to the left. The fingers of the right hand are then passed in the direction of the right foramen ovale until the head is reached, and along their palmar surface, which is turned downwards, the blade is then to be introduced. The reason for bringing the woman quite to the edge of the bed now becomes obvious, as it is only in this way that the handle of the upper blade can be sufficiently depressed to admit of its easy introduction. This blade is introduced, as will be observed, *in front* of the lower blade, as it is only in this way that the two parts of the forceps will lock.* The hand is now to be steadily

* We have frequently observed that students who may be practising these details with the machine and phantom commit the error of passing the second blade without any reference to the direction of the lock in the first. This error cannot possibly be committed in practice if the directions here laid down are observed.

raised, when, under the direction of the fingers, the blade will glide over the right side of the child's head. An excellent guide during this part of the operation is derived from an observation of the inner or metallic surface of the handle, which should remain parallel with the corresponding surface of the lower blade, and the earliest deviation of the blade from its proper course will be found in an inclination of this surface to one side or another. Should this occur repeatedly, after partial removal and re-introduction of

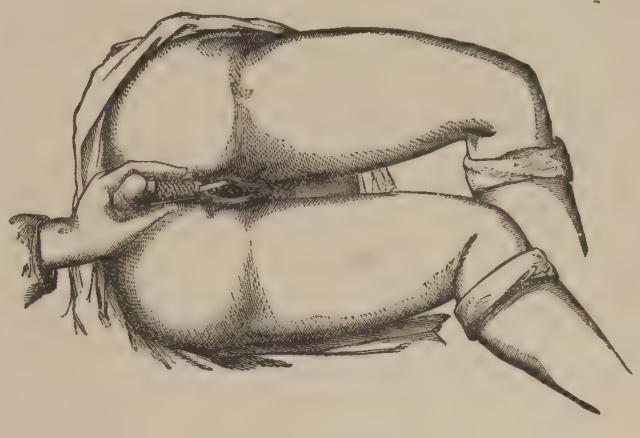
Fig. 102.

Introduction of the Upper Blade.

the blade, it may be advisable to withdraw the lower blade, and introduce it with reference to the other, as there is the possibility of a mistake having been committed as to the position of the head, and it is besides a matter of far greater importance to have the blades exactly opposite to each other, than to have them accurately adapted to the transverse diameter of the head. The best test of a proper application of the forceps is the perfect locking of the blades after their introduction. Fig. 103 shows the blades as adjusted for the first position, the head being in the pelvic cavity, as is indicated by the direction of the handles. The blades being separated by the transverse diameter of the head, the extremities of the handles are about an inch apart.

When the head occupies the second cranial position, the blades are to be applied to the poles of the right oblique diameter. The lower blade is therefore introduced in the direction of the left foramen ovale, from which point the handle is first directed upwards and to the left, and then depressed downwards and to the right. The upper blade is then introduced in the direction of the right sacro-iliac synchondrosis, taking care that it is passed in front of the lower blade, and that the metallic surfaces of the handles retain their parallelism as before. In third positions, the forceps must be applied in exactly the same way as when the head is in the first; and in the fourth presentations as for the second.

Fig. 103.



The Forceps Applied.

CHAPTER XVII.

THE FORCEPS (Continued).

The forceps acts mechanically in three different ways in effecting the object which we have in view: by compression, by traction, and by a double-lever action. In so far as compression is concerned, a certain degree of this is essential, in order to grasp the head with the blades, which otherwise would slip off, or would only be precariously maintained in their position, under certain circumstances, by the pressure of the walls of the parturient canal. But, by compression, something more is implied than mere grasping; for by it, as is obvious from the yielding nature of the sutures and fontanelles, the actual diameters of the cranium may be materially diminished. It is to be remembered, however, that the forceps is usually applied to that portion of the cranium which is least subjected to pressure, and that, therefore, as a rule, little is to be gained by diminishing these diameters. We may, in fact, assume that the pressure which is necessary to insure such a grasp of the head as may render it impossible for the blades to slip under moderate efforts, will effect all the compression which is desirable. Many recommend that a piece of cord or tape should be firmly tied round the handles in order to keep up sustained pressure on the cranium, and it is for this that the depression near the extremities of the handles, which is characteristic of all English forceps, is intended. This mode of procedure is not to be commended, as such serious and sustained pressure may endanger the life of the child. The power exercised by the hands of the operator, if only the handles are of proper size, is quite sufficient for our purpose, and being necessarily intermittent, is free from the danger which attaches to continuous pressure upon structures so delicate and important as are contained within the cranium. Sometimes, when it is necessary to use very considerable force, the full extent of possible compression must be resorted to, but this more with the view of maintaining a secure hold than of gaining much by mere compression. In such a case, the corner of a towel which has been dipped in water may be tightly bound round the handles at the depression alluded to, when the remainder of the towel being wrapped round the handles will give a better hold and more power; but, when this is done, the pressure should always be relieved during the intervals between the pains, or when at any other time we make a periodical pause in our extractive efforts. The amount of compression which is safe will depend in no small measure on the construction of the forceps; and, in an instrument, such as are many of those of French manufacture, with an interval of half an inch only between the tips, the pressure will certainly be attended with more risk than when these are, as they should be, an inch or nearly so apart.

The forceps acts also by Traction; but this force is not applied alone, as in drawing a cork from a bottle, but in combination with the third mode of action of the instrument,—viz., that of a Double

Lever. The forceps, as almost invariably constructed with the English or other similar lock, is composed of two levers—the fulcrum of each being the lock. This enables us, by a swaying movement of the hands, to apply extracting force, partly by leverage and partly by traction, to each side of the head successively, without the danger which attaches to the single lever or vectis, where it is necessary to find a fulcrum in some part of the pelvic wall. Care must be taken, however, not to carry this double-lever action too far, for there is no doubt that when we sway too much there is both loss of power and increase of danger. The more important action undoubtedly is steady traction in the proper axis.

When the blades have been adjusted to the satisfaction of the operator, he now proceeds to the actual operation of extraction. As his object should, in most cases, be rather to aid than to supersede the natural efforts, he must merely assist the pains should they be present, and pause when his assistant informs him that the uterine action has ceased. This leads us to observe, that, if it be practicable, the assistance of another practitioner should always be obtained; for not only is there thus a division of responsibility, but the operator has the great advantage of efficient and intelligent aid, to which he can trust for the management of chloroform, the steadying of the uterus, and many other points of detail, which it is impossible to obtain at the hands of those who are ignorant or inexperienced.

When the action of the uterine fibres has ceased—as in cases of complete inertia—he should imitate nature by applying extracting force at intervals corresponding to the ordinary duration of natural pains. The handles should be grasped by both hands, two of the fingers of one hand being passed up so as to impinge upon the head. The object of this is to ascertain the earliest indication of slipping of the blades, which is always more apt to occur when the distance between their extremities is more than an inch. So soon as he feels that his fingers are leaving the surface of the scalp under the influence of his efforts, he knows that the instrument is losing its hold. The blades should then be disarticulated and pushed back to their original position; and, upon renewed efforts, he makes use of a little more compression, thus striving always to effect the dislodgment of the head with as little of actual force as may be necessary. The force should be applied as nearly as possible in the direction of the axis of that part of the pelvic canal within which the head lies; and the operator should pull steadily, with or without a slight swaying motion of the handles from side to side.

If the head is by these efforts dislodged from the situation in which it has been arrested, and moves downwards into a lower plane of the pelvis, this may, in the presence of efficient pains, be all that is required, as nature in some cases will often complete the delivery. It is better, however, at this stage, not to withdraw the blades, but merely to disarticulate them, and, leaving them in contact with the head, watch the result. If the head now moves satisfactorily with every pain, they may be entirely withdrawn; but, so long as there seems a probability of further assistance being required, it is better to leave them than to run the risk of having again to apply them at a more advanced stage of the labor. If it is a case of inertia, or if there is obvious obstruction at the outlet, our efforts must be continued at intervals as before; resting satisfied with a very gradual advance, and never (unless under exceptional circumstances, when rapid extraction is imperatively demanded) striving for a speedy termination of the case, which might endanger the perineum, and the other soft structures which nature in normal cases very gradually distends.

The direction which, in labor, the head naturally takes is always to be kept in mind. As it descends, therefore, if it has originally been in the cavity when the blades were introduced, the handles are to be carried forwards under the arch of the pubis, and, at the moment of birth, are to be raised in front of the symphysis. It is at this moment that hurry or violence of any kind is apt to lacerate the perineum, so that we should, by every means in our power, closely imitate the process by which nature so admirably effects the dilatation of this structure. It is usual to practise what is called support of the perineum, in forceps as in ordinary cases; but in such means, as a preventive of laceration, we have, for reasons already stated, no confidence whatever. As the head passes from the cavity to the outlet, the natural movement of rotation is not to be forgotten. It is not, indeed, necessary that we should attempt artificially to produce this rotation. Under the influence of the ordinary causes, nature will effect it at the proper time, whereas we might only do harm by misplaced efforts before that time has arrived. Still, it is proper that we should watch the first indications of rotation, and, in our subsequent endeavors, "humor" the blades so as in every way to encourage it.

The situation on the sides of the child's head which corresponds to the blades varies considerably, and will depend, in some measure, on the degree of moulding, or elongation, which may have occurred. When successfully applied, so as to obtain the best possible hold, the tips of the blades will be found to have passed over the ears, and to have grasped the soft parts of the cheek beyond the zygomatic arch. In not a few cases, however, and especially in those in which the forceps has been used before the head has attained the perineum, they do not reach so far, and in these the point attained will be marked by a depression in the temporal region above the zygoma. Beyond the depression just mentioned, the injury inflicted upon the soft parts of the child should be very trifling, even in severe cases. A certain amount of discoloration, from bruising, is sometimes noticed, but this disappears in the course of a few days.

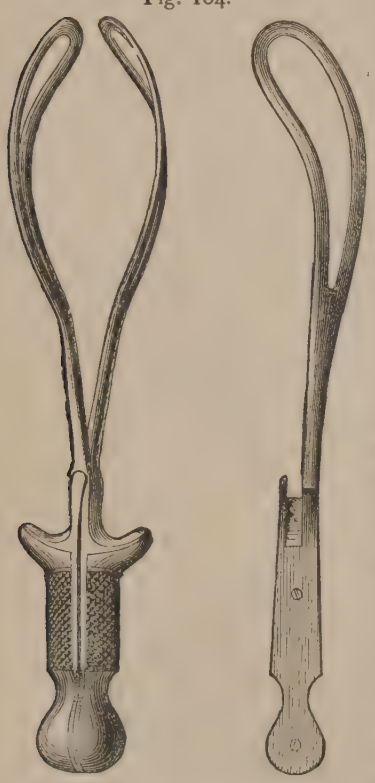
In the third and fourth, or occipito-posterior positions, the difficulties which we encounter are often much more formidable. These difficulties, it is to be remembered, probably depend entirely on the faulty nature of the position. Our first attempts, therefore, should be to remedy these positions, by promoting the rotation which would bring the occiput forwards. Having failed in our attempts to induce this rotation by the fingers, with or without the vectis, we should always try to effect rotation by the forceps, previous to attempting direct extraction. Very special care is here necessary, as a moment's consideration will show, to distinguish between the two occipito-posterior positions. If, for example, we should mistake the third position for the fourth, we would apply our rotating force so as to move the occiput from right to left in an attempt to reduce it to a first position, with the result, if we moved the head at all, of forcing it in the direction of the conjugate diameter, and thus making matters worse, instead of better. If, however, we are confident in our diagnosis, we have only to remember that third positions rotate naturally into the second, and fourth into the first, which at once points to the direction in which alone rotary force can safely be expended. Dr. Tyler Smith says that we should rotate during the process of extraction; but it is better that we should, in the first place, attempt simple rotation, and then, if that fail, combine rotation with extraction. If we succeed in effecting rotation, the case, left to nature, will terminate in the usual way. But, should we fail, it will be necessary to extract directly, without rotation,—a matter often of considerable difficulty.

In delivering by the forceps, while the head remains in an occipito-posterior position, care must be taken to conduct the operation with a due regard to the manner in which nature effects delivery in such cases. If we attempt to drag the head forwards under the pubic arch, we will probably fail; so that we should direct our efforts so as to get the occiput over the perineum,—as it is only in this way that the occipito-mental diameter can be released,—and the forehead is then suffered to sweep backwards from behind the symphysis. The great danger is rupture of the perineum, which, in some instances, it will be almost impossible to avoid; but, when the pelvis is of good size, the difficulties attending delivery in such a position are by no means so great as might be supposed.

The Long Double-curved Forceps.—Whatever opinion may be entertained as to the propriety of employing the forceps with a double curve in all cases, without exception, we have no doubt that

the long forceps, as applicable to cases where the head is at or above the brim, can only be used with safety when constructed on this principle. The objection to the long straight forceps in this situation is pretty obvious, if we reflect that extraction, exactly in the axis of the brim, is impossible, as the line representing that axis passes through the coccyx, or even the lower part of the sacrum. It is not, indeed, until the head has fallen well into the cavity, that it may be supposed to occupy a plane the axis of which passes in front of the perineum. Not even with the pelvic curve can we pull directly in the axis of the brim, but we are able more nearly to approach to what is desiderated, and, what is much more important, to do so with comparative safety. If the straight forceps is used at the brim, not only do we pull the head too much forwards, but we do so to the imminent danger of the perineum, against which the shank of the blades is pressed. And, if we overcome the first resistance, the widening of the blades as they descend exposes this structure to ever-increasing danger as the child descends, for it is not till the head reaches the lower third of the cavity that we can bring the handles forwards. The risk to the perineum is, no doubt, much lessened, if we use an instrument in which the shanks are approximated for some distance, so that the curve of the blades springs from a point several inches from the lock, as in a modification of Beatty's forceps, which has been very commonly used.

Fig. 104.



Forceps for Application at the Brim.

In the construction of this variety of long forceps, bearing in mind the rule already laid down, our first point is to insure strength without clumsiness. There is good reason to believe that the neglect of this precaution has been the cause, in many instances, of the instrument slipping again and again. There is no necessity for the blades, if of proper material, to be of great thickness, but the handles should always be large, of sufficient size, indeed, to be firmly grasped by both hands. Endless varieties and modifications of the long-curved forceps have been devised, and it is but natural that every operator should prefer his own. The instrument here shown (Fig. 104) is somewhat similar to what is known in this country as Simpson's forceps, which was adapted by him from the pattern of that used by Naegele and other German accoucheurs. The joints are made so loose as to admit of very slight lateral motion or overlapping, and below the lock there are transverse rests which give more power to the hands; "the long forceps," as Simpson observes, "being only properly used as an instrument of traction, not of compression." The length of the instrument which we have represented here is sixteen and a half inches, being ten and a half inches from the lock to the tip of the blades, and six inches for the handles. The measurements between the blades should be the same as those of the medium sized instrument above described, and the fenestræ about five and a half inches in length. The instrument is thus, as is believed, both longer and of greater strength than those which are generally employed by English practitioners. It is, we believe, inferior in efficiency to none, and, if used with due caution, equal in point of safety to any. No one should, however, under any circumstances, take such an instrument into his hands without a sense of responsibility much greater than attaches to the ordinary operation.

The long forceps, in the sense in which we employ the term, is applicable to cases in which the head will not enter the brim or descend beyond the upper part of the cavity. The cases which are held to warrant its employment are chiefly those in which the head is arrested at the brim by reason of moderate contraction of the conjugate diameter. Great care must therefore be taken, in the first instance, to ascertain the degree of deformity, and to make sure that the case is really one in which the forceps may be used with a reasonable prospect of success; for, if not, nothing can be more irrational than to subject the woman to the not inconsiderable risk which attaches to this operation, even under the most favorable conditions. When the child is dead, and the estimated difficulty in extraction is considerable, most accoucheurs would prefer to deliver by craniotomy; but, if on the contrary, there is evidence of the child being alive, nothing can be more repugnant to the feelings than the idea of an operation which deliberately destroys a life, and we will naturally prefer any procedure which may give the child a chance. To yield too far to this inclination would, however, be manifestly wrong, for the mere fact of the child's life need not enter into the calculation when it is obvious that it must, sooner or later, be sacrificed. Our whole attention, in such a case, should be centred in the mother, in whose interests, therefore, we should decide upon that operation which is likely to subject her to the least possible risk.

But it is not against craniotomy alone that the long forceps may be balanced, for there are cases in which the question for decision is between the forceps and turning, as will be better understood when we come to consider the conditions under which we have recourse to the latter operation. It has been said that the forceps is a "child's operation," but we would take a very narrow and improper view of the scope of the instrument did we conclude that it was always so, and that it was inapplicable in the interests of the mother. The results of craniotomy are, according to Churchill, about one maternal death in five, and we may be sure that when the head is high in the pelvis the figures will be more unfavorable still. Nothing can be more absurd, therefore, than to assume that, in so far as the mother is concerned, craniotomy and the long forceps stand to each other in the relation of safety and danger; and yet it would almost seem that this was the idea which prompted some, even in modern times, to declare in favor of the former.

The operation by the long forceps is one to which, as a rule, a certain degree of difficulty and danger is attached. This arises from the peculiar circumstances of the case, as compared with the ordinary forceps operation. There can scarcely be a stronger contrast than between a case requiring the application of the ordinary forceps, when the head lies upon the perineum, and is arrested by simple inertia, and one in which a contracted brim prevents the head from entering the pelvic canal. In the one, we have the operation in all its details so thoroughly within our control, that we almost cease to look upon it with the slightest apprehension. In the other, we are operating comparatively in the dark, and at great mechanical disadvantage; we have to subject, to an extent which we cannot fully be aware of, delicate textures to violent compression; we have to drag the head through the whole length of the pelvic canal instead of merely disengaging it from its lower extremity; and, finally, we have to determine between the amount of actual obstruction and the degree of justifiable force, with a nicety upon which success or failure will depend. Is it, then, to be wondered at that the operation is looked upon with apprehension as one beset with difficulties and dangers?

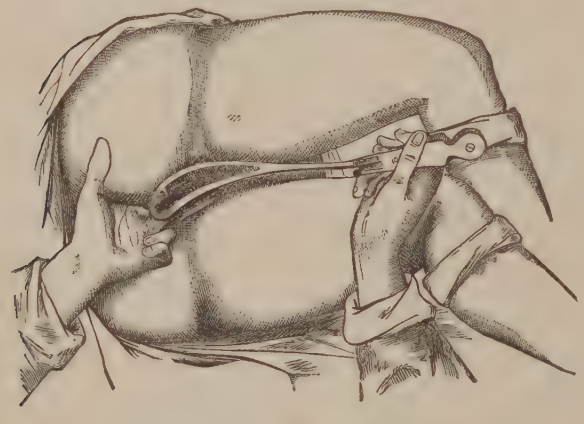
While we freely admit that the objections with which delivery by the long forceps is beset are in themselves sound, we must, at the same time, express our conviction that they have been, to a great extent, exaggerated, and that more by British than by Continental and American obstetricians. We see no reason to doubt that, when skilfully and warily employed, the best results will, in many instances, follow from its use—the one essential element

which, above all others, will contribute to success, being a careful selection of proper cases. It is now very generally believed, by those who have had the greatest experience, that a large proportion of the unfortunate results depend upon improper instruments, and especially upon the use of such as are deficient in power. The observations which, on this point, we have already quoted from Dr. Barnes, apply here with peculiar force. Power and control are correlative factors towards the attainment of the result which we desire, and if there is a deficiency in the former we can have but little confidence in the issue of the case.

As regards the mode of application, the long forceps differs in many essential particulars from the other. Exceptional cases may no doubt occur, in which the forceps is applied at the brim to effect delivery, which is called for in consequence of inertia, hemorrhage, and the like; but in such cases (in which we may assume the pelvis to be of normal dimensions) the operation of turning will generally be preferred. Delivery by the long forceps may practically be considered as an operation in which the head is arrested by reason of contraction of the pelvic brim. Our object, then, is not to apply the blades in the opposite oblique diameter of the pelvis to that occupied by the child's head, so as to secure their adaptation to the sides of the cranium, but rather to introduce them with special reference to the pelvic walls, so as to be sure that each passes along the side of the pelvis, and is thus opposite to the other in or near the transverse diameter of the brim. When the head is still above the brim, it usually occupies, as we have seen, a position which is more transverse than oblique, and the effect of conjugate contraction at this part is to maintain that position even after the head has actually engaged in the brim. Were we here to follow the usual rule, and did we succeed in applying the blades in that way, their grasp would be in the conjugate diameter, and in every effort we would run the risk of subjecting the soft parts of the mother to injurious pressure between the blades and the poles of the conjugate measurement—the chief danger being posteriorly against the projecting sacral promontory. Consequently, we must discard all preconceived ideas and rules, and pass the blades in the direction in which there is most room.

The patient may here also lie on her left side; and there is this advantage in the double-curved forceps, that there is not the same

Fig. 105.



Introduction of Long Pelvic-curved Forceps.

necessity for bringing the hips over the edge of the bed, as from the nature of the pelvic curve the handle of the upper blade does not require to be nearly so much depressed. The rules given for the introduction of the blades in these cases vary considerably. We prefer, as in the case of the ordinary forceps, to pass the lower blade first. Some operators, following the advice of Madame Lachapelle, pass this blade along the sacro-sciatic ligament; but the most experienced of modern authorities prefer to pass it over the perineum into the hollow of the sacrum, a little to the left of the middle line. If the former method be practised, the handle must be directed somewhat to the right, although much less so than in the case of the straight forceps. If, on the contrary, the operator should select, as we would recommend, the second process, the blade may be directed, as is here shown (Fig. 105), pretty nearly in a horizontal position, into the hollow of the sacrum. That the introduction of the double-curved forceps is a more complicated proceeding than the operation previously described, no one will dispute; and this indeed will appear from the description of this stage of the process given by Dr. Barnes: "As the point of the blade," he says, "must describe a double or a compound curve—a segment of a helix—in order to travel round the head-globe, and at the same time to ascend forwards in the direction of the Carus' curve so as to reach the brim of the pelvis, the handle rises, goes backwards, and partly rotates on its axis. The handle is now carried backwards and downwards to complete the curve of the point around the head-globe, and into the left ilium. Slight pressure upon the handle ought to suffice. This will impart *movement* to the blade; the right direction will be given by the relation of the sacrum and head." Dr. Barnes further illustrates this by the following diagram (Fig. 106), which we have slightly modified.

The actual introduction of the blade is by no means so difficult, nor is it a matter of such nicety as the above description would seem to imply. The most scrupulous care should in every case be

Fig. 106.

Diagram, showing the various Stages in the Introduction of the Long Forceps (Lower Blade).

taken in guiding the blade by the fingers within the os uteri; and, when this has been effected the mere raising of the handle, after the blade has been so far introduced, causes it to glide upwards, unless some obstacle should exist to impede its progress. When thus adjusted to the side of the head, the weight of the handle will tend to keep it in position, but this will be more certainly effected by intrusting it to an assistant, who should hold it back towards the perineum to facilitate the introduction of the upper blade. As in the case of the other, this blade may also be passed in the direction of the hollow of the sacrum, and is carried in front of the lower blade, to the right of the middle line. The handle being now depressed and carried backwards, its movements direct the blade along the convexity of the child's head towards the right ilium;

and, when the movement is complete, the handles should be in apposition and lock easily. Success in this will, however, depend upon the extent and nature of the distortion; but, if the lateral walls of the pelvis are normal as regards their various planes, no great difficulty, after a little practice, will be experienced in the introduction and adjustment of the blades. The facility with which the lock is adjusted may be looked upon, not only as evidence that the blades are in contact with opposed surfaces of the head, but also that the case is one in which we may hope for a favorable result. But if, on the contrary, we do not succeed in introducing and locking the blades after one or two attempts carefully conducted, we must abandon the case as one unsuitable for the operation.

[When using the forceps we have always preferred to have the woman upon her back, and that is the usual position for the use of the forceps in this country. There can be no objection to it and in our judgment there are many advantages over the position upon the side. The pelvis is more firmly fixed, there is less difficulty in recognizing the relative position of the points of the pelvis with the head of the child. The legs of the patient do not interfere with the operator and by bringing the woman's hip over the edge of the bed the operator can by depressing the handles apply the forceps at the superior which is very difficult to do with the patient on her side.—G.]

It is assumed by many writers that the blades, when thus introduced, correspond to the antero-posterior diameter of the head. It is not so however. The head, indeed, very generally occupies the transverse diameter of the pelvis, but the tendency of the blades is to adapt themselves to one or other oblique diameter, as has been shown by Simpson. This has been conclusively established by examination of the head, after delivery by this process, when it is found that one blade has passed behind the ear, and the other has reached over the frontal bone on the opposite side, and has been applied over or in the immediate neighborhood of the orbit, as is indicated in Fig. 107.

The forceps being thus applied, the next step in the process is an attempt at extraction. Remembering the power which we possess in so formidable an instrument as this, we must, in the first place,

Fig. 107.

Long Forceps Applied.

exercise great caution in the matter of compression; and this point is all the more necessary, as the handles will be found to gape more than usual, owing to the length of the cranial diameter which is between the blades. Moderate compression is all that is necessary to maintain the position of the forceps when well applied, for we know that it is not by manual compression only, but also by compression of the blades by the walls of the natural passage, that their grasp is sustained. The handles are to be seized by both hands and steady traction practised, the direction at first being somewhat backwards. As in the case of the ordinary forceps, the traction must not be continuous, but in aid of present, or in imitation of absent pains; and, at the same time, we combine with mere pulling effort a moderate degree of the swaying or double-lever action, taking great care not to injure the perineum.

The thorough control which the size of the handles gives us over the instrument enables us to perceive with greater accuracy whether or not the head can be dislodged by such efforts as we are justified in making. This may be more exactly ascertained by passing the finger from time to time in the direction of the head, when the descent of the occiput or the rotation of the sagittal suture towards the conjugate diameter may afford clear evidence that the head is making progress. As it descends, the handles of the forceps will be observed to rotate, and in some cases it may be possible to assist the rotation. When this stage has been reached, it will be proper to carry the handles more forwards, and to pull rather downwards than backwards, following the curved axis of the pelvic cavity. Finally, the operator must carry the handles forwards and upwards in front of the symphysis; and, in order that this may be effected with ease, the right thigh should be raised by the nurse, or the patient may be laid on her back so as to permit the handles to move upwards in the direction of the umbilicus. The operator must, however, beware of moving the handles prematurely in this direction, as he may thereby do mischief. And there is another danger which he must specially avoid, viz., the ploughing up of the perineum by the blade which, in consequence of the rotation, is now turned against it. This may, no doubt, be avoided by disarticulation of the blades as the head approaches the outlet; but, as it is often necessary to continue the traction to the last, extreme caution must at this stage be observed. In nothing should we be more particular than in the slowness and deliberation with which we conduct the various stages of this operation; for, in all the details, the more closely we are enabled to imitate nature, the more likely is the operation to have a successful result.

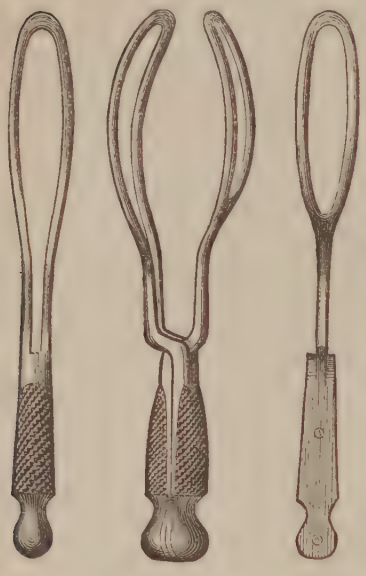
It may be necessary to apply the forceps in the treatment of presentation of the face. So long as the chin is turned forwards, as it is in what we have described as the third and fourth varieties, the case is in all respects a normal one, and should be left to nature. But inertia, and the other causes which call for the forceps in a cranial position, may, in such a case, exist also, demanding instrumental assistance. The application of the forceps is here in no respect more difficult, nor more serious, than when the vault of the cranium is the presenting part, the chin being regarded throughout as strictly analogous to the occiput in the mechanism and direction of its birth. The rules, therefore, which have been laid down for the application of the forceps in occipito-anterior positions of the vertex, may here be adopted, *mutatis mutandis*, with equal propriety. It is very different when we have to deal with a mento-posterior position of the face, which is by far the most unfavorable of all possible presentations of the cephalic extremity. Such is, as we have seen, the probable position of the majority of face cases at the beginning of labor, rotation of the chin forwards occurring as the head descends.

But the cases to which we refer are when this rotation fails, and when the head descends into the cavity in its original position with reference to the pelvis. Two methods of treatment have here been suggested, and have apparently been practised with success; these being application of extracting force over the occiput, so as to convert it into an ordinary cranial position, and rotation by the forceps, so as to convert it into a mento-anterior position. Smellie, Cazeaux, and others have succeeded by the first method; but that which seems most practicable, at least from a theoretical point of view, is rotation, a manœuvre which, for obvious reasons, can only be practised with the straight forceps. By the latter means, rectification has in many instances been effected, so as to insure a favorable termination of the labor; and it would be proper in every such case to make the attempt; but, if we fail, and the symptoms indicate

approaching exhaustion, or are otherwise such as are held to imply a necessity for speedy delivery, we have no resource remaining but craniotomy. If, in a deformed pelvis, the face presents at the brim, turning is better than the long forceps in most cases; and if the chin is backwards, there can be no doubt about it.

In all cases of pelvic presentation, and in the last stage of delivery by podalic version, we have the forceps ready, lest any difficulty should arise in regard to the extraction of the head by the ordinary process. The chin in such cases, being almost always turned backwards towards the perineum, the blades are passed in front of the sternum of the child, over the chin and sides of the head. The body of the child is then to be carried upwards, towards the abdomen of the mother, by an assistant, when, if the handles of the forceps are made to follow it in the same direction, combining the movement with a moderate amount of traction, the head will usually be extracted without difficulty. This is an operation in which delivery must often be effected with greater precipitancy than usual,—as, for example, when twitching of the limbs shows that asphyxia is impending. There are other comparatively rare instances, in which the operation is not effected with such ease. We may encounter cases, for example, in which the trunk being born, the face has not rotated backwards. These are the instances in which Madame Lachapelle advises us to rotate the face by the finger before extracting it; but, if this cannot easily be done, it will be better to adopt the plan suggested by Velpeau, and endeavor to drag down the occiput beyond the edge of the perineum, and deliver the head by a movement of extension, instead of, as is usual, by the ordinary one of flexion. There are cases, also, in which the head, after turning or in breech presentation, is arrested at the brim in consequence of deformity, when it might be possible to deliver by applying the forceps along the sides of the pelvis; and there are instances, rarer still, in which the head is separated, and left behind in the cavity of the uterus, where we must attempt extraction by the forceps, so adjusting the blades as to prevent the possibility of the occipito-mental diameter being thrown across the pelvis.

Fig. 108.



Ziegler's Forceps.

The difficulties which, under special circumstances, attend the introduction of the forceps have given rise to innumerable modifications of the instrument, none of them (with a few exceptions, such as the forceps of Mondotte, in which the blades do not cross) affecting the general principles upon which the instrument is constructed. To one or two only of the more important of these we may call attention. Dr. Ziegler of Edinburgh has recommended a forceps (Fig. 108) of which the blades are straight, but dissimilar. The fenestra of one blade is carried down to the handle, and in introducing the instrument, the elongated fenestra is slipped over the handle of the other blade, which has been previously passed, and which serves, therefore, as a guide for the adjustment of the other. What is described in the *Obstetrical Society's Catalogue* as Mr. Philip Harper's forceps seems, both in principle and in construction, to be identical with Dr. Ziegler's.

Dr. Radford, again, has invented an instrument (Fig. 109), of which the blades are of unequal length, and in which there is a reversed position of the lock. This ranks as a long straight forceps, and is designed by the inventor for application to the head when it is arrested at the brim, the long blade being passed over the face, and the short one over the occiput. The opening formed by the curve in the shank of each blade is for the purpose of passing a handkerchief through, and will enable the practitioner, in addition to his hold of the handles, to use very powerful and effective extracting force.

Although the English lock is justly looked upon as one of the most important points in the construction of the forceps, there is no doubt that a most efficient instrument may also be constructed in which the lock is at the end of the instrument. This is the case in Mondotte's forceps already mentioned; and also in Assalini's forceps (Fig. 110) in which the hand grasping the centre of the instrument keeps up a steady pressure, proportionate to the amount of force which is being employed; and over which the operator has a most sensitive and efficient control. Some even in England, prefer it to our ordinary instruments.

To these we might add numerous varieties, which exhibit infinite peculiarities, and which differ from the familiar standards in the nature of the curves, pelvic or cranial, the length of the fenestræ, the width of the blades, and the arrangement of the shanks, handles, and locks. To describe even a tithe of these would carry us beyond our prescribed limits, and would serve no useful purpose.

In expressing a preference for the straight over the double-curved forceps, in all ordinary cases, we must not be supposed dogmatically to condemn the latter instrument in what are generally called short

Fig. 109.

Radford's Forceps.

Fig. 110.

Assalini's Forceps.

forceps operations, or, indeed, in any other, save those in which we use the forceps for the purpose of effecting rotation. The authority of those who have pronounced more or less emphatically in its favor is of too great weight to be overlooked. We are inclined, more particularly, to admit the force of Simpson's observation, that it is well for the operator to accustom himself to the use of one kind of instrument only, as a strong argument in favor of the pelvic curve; but on the other hand, we entertain personally a strong conviction that the straight forceps, while it can effect, below the upper third of the pelvic cavity, everything which the other can achieve, is essentially easier of application by beginners, as it is, undoubtedly, simpler in construction than its rival. When once its special difficulties are overcome, we cannot doubt, however, that in hands familiar to its use, the double-curved forceps fulfils all the indications of a safe and efficient extractor.

We would conclude this chapter with a single word of caution to the young practitioner who has overcome the preliminary difficulties, and who has attained a certain amount of confidence and skill in the use of the instrument. It is to beware lest this should lead him to a too frequent and unnecessary application of it. Above all, let him remember, that no mere question of time, or of his own convenience, can ever be a sufficient warrant for operative interference. No operation is without risk, and nothing, therefore, short of a conscientious conviction that he is about to act in the interests of the mother or the child, can ever absolve him from the responsibility which attaches to him in virtue of the position which he occupies. But, on the other hand, he must no less carefully avoid the error of excessive timidity, which may deter him from assisting his patient in many a case where prolonged and needless suffering means increase in danger to her and to her child.

CHAPTER XVIII.

THE VECTIS; FILLET; BLUNT HOOK, ETC.: DECAPITATION.

About the same time that the discovery of the Chamberlens was gradually brought to light and introduced into practice in this country, the Vectis or Lever was being used for the delivery of women in Holland by Roonhuysen. The frequent sacrifice of infant life—which was rendered necessary in cases of difficult or obstructed labor—was no doubt the cause which, in both cases, turned the attention of the inventors to the subject, with the earnest desire to devise any means whereby the crotchet and perforator might be superseded by some contrivance which would deliver the woman without destroying her child. The discovery of Roonhuysen, although of much less importance than that of Chamberlen, was an inestimable advantage in practice; and, by the rude instrument contrived by the Dutch accoucheur, many successful operations were performed by himself, his son, Ruysch, and some others to whom the secret had been communicated. This original lever was of the simplest possible construction, and consisted of a flat piece of iron, bent at each end into a slight curve, and covered with soft leather to protect the parts. The secret of the lever was eventually purchased from those to whom it had been handed down after Roonhuysen's death, by two Dutch physicians, Visscher and Van den Poll, whose names are more worthy of being recorded than those of the inventors, as they jointly paid the sum of 5,000 livres in order that they might impart to the world a secret which should never have been withheld. As the knowledge spread, the simple contrivance of the originators became altered and modified, until it resulted in the vectis of the present day.

One is apt to suppose that, as the vectis is now seldom used, it has been discarded as a worthless instrument. So far, however, from this being the case, the vectis must always be looked upon as an extractor of considerable power and efficiency, and the sole reason for the neglect into which it has now fallen, is simply because it has been utterly thrown into the shade by the forceps. There are, moreover, even in the present day, practitioners of great experience who occasionally use the vectis in certain cases in preference to the more familiar instrument. The modern vectis has, in its general appearance, a certain resemblance to a single blade of the forceps, and, like the latter, varies greatly in its shape, handle, and fenestra; but more particularly in the curve which is given to it with a view to efficient adaptation to the head of the child. The variety which is here represented is one of the best known of the numerous modifications of Roonhuysen's lever. It is sometimes furnished with a hinge between the handle and the blade—a principle which has also been applied by some to the forceps, with the view of facilitating the introduction of the upper blade. Such an arrangement is, however, quite unnecessary, if the woman is placed in the proper position on her left side, and her hips are brought quite over the edge of the bed, when it may be introduced without difficulty with reference to any position of the head, or any part of the circumference of the pelvic wall.

If we had not at our command a safer and more perfect agent in the forceps, there can be no doubt that the vectis would be an instrument of every-day use for the extraction of the child, whether employed as a lever or a tractor. These two ideas have, manifestly, been the guiding principles upon which suggestions as to the modification of the instrument have been based; when the idea of leverage has predominated, the curve has been slight; whereas, when traction has been the object, the curve has been greater, so as to secure, for this purpose, a firmer hold of the head. No efficient action of the vectis can, however, be produced, unless the principle of a simple lever is more or less brought into play; for, even if we admit it as possible that it may act as a tractor, it can obviously act only upon the end of a cranial diameter, which latter becomes a lever, the fulcrum of which is at the other pole of the diameter thus acted upon. But its efficient action is scarcely compatible with this idea, as it will generally be found necessary so to use it as to make the blade itself a lever, the fulcrum of which must be found in some part of the pelvic wall. This, in fact, is the great objection to the vectis, when we compare it with the forceps, where the fulcrum of each blade is the lock. It may no doubt be possible, in the case of the single lever, to protect the soft parts by interposing a finger where the force is brought to bear upon the fulcrum, and we may be sure that this is the manner in which Roonhuysen and his followers operated; but still, even under the most favorable circumstances, the danger which arises from such a plan of action must be viewed as considerable, and in direct proportion to the mechanical force employed.

Fig. 111.

The Vectis.

When the vectis is used with the view of facilitating delivery in cases of cranial presentation, it is essential, in the first place, that the position of the head be accurately ascertained; and, further, that the operation should be conducted with a perfect knowledge and appreciation of the laws upon which the natural phenomena of parturition depend: the object being chiefly, therefore, to bring the occiput forwards under the arch of the pubis. If we should thus succeed, by pulling down the occiput, in increasing the occipito-frontal obliquity of the head, it is clear that we are, at the same time, closely imitating the process by which nature manages the descent of the head. This may, if the uterus is acting efficiently, be all that is required; and, in any case, it advances matters a stage. But, in cases of unusual difficulty or absolute inertia, little ultimate good will result if we stop short at this stage of the operation so that we can only act effectively by bringing our force to bear against the two ends alternately of the occipito-frontal diameter. So soon, therefore, as we have succeeded in causing the occiput to advance, the vectis is to be withdrawn and adjusted to the frontal pole; and by thus acting, now on the occiput and again on the forehead, we may certainly and steadily cause the head to advance in the direction of the outlet. A blade which is sharply

curved will, no doubt, take a firmer hold of the part to which it is applied, but this advantage is probably more than counterbalanced by an increased difficulty in its introduction. It is for this reason that a more gentle or wider curve has been generally preferred, which, while permitting of easier introduction, makes it more necessary that the blade itself should be used as a lever; and, indeed, some have gone so far as to say that no vectis can possibly be better than a single blade of the straight forceps.

It would appear that the cases in which the modern accoucheur may with advantage have recourse to the vectis, are those in which his primary object is to act upon the occipito-frontal diameter of the head. Should it seem, therefore, that all that is necessary is to insure the descent of the occiput, it is possible that delivery may thus be effected with even more safety than by the forceps, where the action bears upon the poles of the transverse diameter. Contingencies may also arise, in the course of many operations in midwifery, in which the operator might avail himself of the vectis if it were at hand; but it is probable that in no instance is the vectis more applicable than when we wish to correct malposition of the vertex. The natural process, by which occipito-posterior positions of the vertex terminate by rotation, has already been fully described; and it has also been observed that an essential condition to such rotation is the descent of the occiput along the posterior pelvic wall, while the forehead remains high in the direction of that cotyloid cavity to which it is turned. In proportion, therefore, as the forehead descends (*fronto-cotyloid* position of West) along the anterior wall, the more do we despair of natural rotation, and look with apprehension to the probability of a tedious labor, or a birth with the forehead to the pubis. Much may, as we have shown, be done by the fingers of the operator directed against the frontal end of the occipito-frontal diameter; and, indeed, while propulsive effort exists, nothing is so likely as this to encourage descent of the occiput. But when this procedure fails, we have in the vectis a powerful auxiliary, which we may pass over the occiput; and thus, by pulling the occiput down and pressing the forehead up, we act simultaneously upon the two poles of the long diameter, in restoring or maintaining that position of the head in which alone nature effects rotation. We may even conceive it possible, that, by a similar mode of procedure, we might convert by this instrument a face presentation into one of the vertex, by producing a rotation of the head on its transverse axis. We may assume, however, as a matter of fact, that, with rare exceptions, the vectis, although a powerful instrument, is completely superseded by the forceps—by which can be effected more speedily and more safely, almost all that the vectis can accomplish.

The Fillet (*laqueus*) is probably the most ancient of all the instruments used in obstetrics with the view of extracting a living child. In its simplest form, it is nothing more than a loop or noose, which may be variously adjusted so as to facilitate the delivery of the child. It has been constructed, according to Ramsbotham, "of a strip of strong cloth, silk, or leather, forming into a running noose, and was sometimes sewn up like an eel-skin, open at both ends, to admit the introduction of a piece of whalebone, cane, or wire, throughout its entire length, by which its application might be facilitated. It was intended to be introduced over the head in whatever way was most easily accomplished; and, this done, the cane was to be withdrawn, the loop tightened, and extraction was to be effected by main force." Such an instrument is, in as far as cranial presentations are concerned, so manifestly inferior to the forceps, that we can scarcely wonder that it has so completely fallen into disuse as not even to be mentioned in many of the best works on obstetrics. Some modern authorities have, however, to some extent, approved of the principle upon which it is constructed, and have directed their ingenuity to the manufacture of a more perfect instrument, of which the "whalebone fillet" (Fig. 112) is the most familiar illustration. Its length is about ten inches, the loop being seven inches and a half, and its extreme width three inches and a half. In its application, the loop is to be passed over the occiput, and steady traction exercised, when, if this is not sufficient, it may be adjusted over the forehead or chin, thus alternating the extracting force between the frontal and occipital poles of the long diameter of the head, in a manner somewhat similar to what is practised in the case of the vectis.

The fillet may still be usefully employed in the management of breech presentations, when delivery is arrested either by inertia or disproportion of the parts. Some have, under such circumstances, insisted that the forceps may be used; but the experience of the great majority of practitioners has shown that we cannot depend upon that instrument, which is essentially constructed for application to the cranium. A most efficient means of extraction is, no doubt, afforded here by the blunt hook, but the objection to that instrument, as has already been stated, is the injury which may, by its use, be inflicted upon the groin and genital organs of the child. The fillet may, however, be substituted, and employed both with safety and efficiency. A simple loop or noose, as was the nature of the original fillet, is, in such instances, to be passed over the flexure of the thighs, by means of the fingers, an elastic catheter, or (as has been suggested) the instrument which was designed by Bellocq for plugging the posterior nares. Nothing serves the purpose better than a simple skein of worsted, one end of which is introduced in this way, and the other extremity then passed through it so as to form a running noose. This noose may, again, be adjusted so as to direct the extracting force in the proper manner; and, as our object generally will be to pull down that hip which is turned forwards in the pelvis, in advance of the other, the noose should therefore be placed nearly over the anterior ischial tuberosity.

Fig. 112.

Whalebone Fillet.

Fig. 113.

The Blunt Hook.

Fig. 114.

The Crotchet.

The Blunt Hook (Fig. 113), which is here shown, is also an instrument of ancient date. It has been recommended in cases of obstructed breech delivery; but the danger of wounding the soft parts of the child which it entails, is now very properly held to be such a serious objection to its use, that it has been entirely discarded in cases where there remains a possibility of the child being alive. In all cases in which the child is ascertained to be dead, the blunt hook may be used without hesitation; and, in these cases, it is a powerful auxiliary to many of the more important operations of midwifery. It is, however, less an instrument adapted to any special operation, or operations, than one which may be useful in a hundred different ways, while we are attempting to extract the child in cases of unusual difficulty. It acts most powerfully when hooked into the flexure of a joint. In this way, as we have seen, powerful extracting force may be brought to bear, when the breech presents, by passing it over the groin; and, in like manner, in cephalic presentations, the shoulder may be made to advance by tractile effort of a similar kind brought to bear upon the axilla.

But while these are, perhaps, the circumstances under which the blunt hook is most frequently and usefully employed, it gives no idea of the real scope of the instrument. This, indeed, embraces points in the detail of many of the chief operations of midwifery; and, in the forcible extraction of the child, after the performance of craniotomy, or embryulcia, the hook is almost indispensable. Its advantage, as compared with the crotchet, is that, as there is no necessary laceration attendant upon its employment, it is not absolutely unsuitable for the delivery of a living child; and, besides, that being blunt, there is not, should it chance to slip, the same risk to the maternal parts.

The Crotchet (Fig. 114) was described by Hippocrates, more fully by Ætius, and is alluded to more or less distinctly by all the ancient writers on midwifery. It is, like the instrument just described, a hook; but it differs essentially in this, that it is always sharpened, so as to pierce the tissues, and thus secure a better hold. In its nature, then, the crotchet is an appliance which can never be used when we have any hope, however remote, of saving the life of the child. The introduction and fixing of the instrument is a matter of little or no difficulty, nor is it attended with any danger to speak of, as the sharpened portion, being the point of the hook, is turned downwards. But, so soon as the direction is reversed, and we attempt extraction, the crotchet becomes, in careless and inexperienced hands, a highly dangerous implement. In all cases, therefore, in which a sufficient hold can be had, we will, as a matter of course, prefer the blunt hook: but, when it is necessary to act upon flat surfaces, the blunt hook is worthless, and we are obliged to have recourse to an instrument which may penetrate, and thus be fixed upon any surface to which it is applied. The nature of the crotchet renders, however, the maintenance of its grip upon soft tissues extremely precarious, and any violent effort at extraction can scarcely fail to cause extensive laceration, which, in its turn, permits of the sudden detachment of the instrument from the point at which it has been fixed to the fœtal tissues, and possible laceration of the maternal parts.

Every practical accoucheur knows that no confidence whatever can be placed in the instrument as a tractor, unless we can fix it in some unyielding part of the bony structures, upon which alone we can safely bring anything like efficient effort to bear. But, even this is far from safe; for, under the influence of powerful effort, the crotchet may at any moment, even when it is apparently well fixed, break suddenly from its attachment. This is, in fact, the special danger of the crotchet and the great objection to its use, as by such an accident the maternal structures may, in a moment, be seriously, or even fatally injured. It is on this account that no sound practitioner will ever use the crotchet without taking great pains to guard against the result which may possibly ensue; and he therefore invariably uses the finger of one hand as a guard to the crotchet, so that, if it should slip, the maternal parts are efficiently protected. An instrument called the "guarded" crotchet, in which a spoon-shaped blade is substituted for the fingers, as a guard is, as we shall find, occasionally used at a certain stage of the operation of craniotomy.

While we thus admit the full force of the objections which exist to the use of the crotchet, it must be confessed that, in cases of great difficulty, it is a valuable, and almost indispensable aid. The point of greatest importance is to secure for it a firm and unyielding attachment, so that it is usual to try to fix it in the orbit or mouth, or elsewhere in the same region, so as to maintain an efficient hold upon the irregular bones of the face; and, in those instances in which it is passed within the cranium, or any of the other hollow cavities of the body, the same principle guides our action, so that we may find ourselves at one time fixing it in the foramen magnum, and at another attaching it to the spinal column, or the pelvic brim.

The nature of the crotchet is such that it can operate upon one point only of the circumference of the head, or other presenting part. If we act, therefore, in a cranial presentation, in this manner upon the orbit, we run the risk of dragging down the forehead by a movement of the head on its transverse axis without securing any actual advantage, and with the possibility, if the chin be backwards, of making matters worse. Ætius, in one of the most interesting passages of his obstetric works, recommends that we should operate by two crotchets, applied at the sides of the pelvis, to opposite surfaces of the child's head, and then pull downwards, in order that the traction may be equal, and in the direction of the resultant of the two forces (*ad neutram partem declinans*). Had he but thought of the possibility of applying the same principle to the delivery of the living child, he would almost inevitably have discovered the forceps. But, as in the case of Hippocrates and the olive, such speculations are perhaps more interesting than instructive. The hint here given, as to the combined action of two crotchets, is not to be despised, as there are certainly cases in practice in which the principle indicated might usefully be adopted; and this, in fact, was recommended and practised by Dr. Davis. In so far as cranial presentations are concerned in which the forceps fails, or in which the use of that instrument is contra-indicated, no good can possibly result, except under peculiar circumstances, from the use of the crotchet, until we have already diminished the head by perforation of the cranium, and extraction of its contents.

Decapitation.—An instrument closely resembling, in shape and general appearance, the blunt hook, but which is usually sharp within the curve, has been used with success in the treatment of those difficult cases of transverse presentation in which the ordinary methods of treatment have failed. This operation simply consists in abridging the long diameter of the child by a section made at the neck. It is described by Celsus, and by many writers subsequently; but, with the exception of Davis, Ramsbotham, and, more recently, Barnes, the subject has not received that attention in this country which it seems obviously to merit. It seems to us advisable, therefore, that we should in this place describe the operation somewhat in detail. This mode of procedure is chiefly applicable to those instances in which we have to deal, either with a neglected case of shoulder presentation, where the body of the child is partly impacted, or is so tightly embraced by the uterus as to render turning impracticable; or with a case in which the difficulty arises mainly from pelvic distortion, complicated with a transverse position of the child.

The form of hook already described is that which is best known in this country under the name of Ramsbotham's hook; but a number of other instruments, more or less resembling this, as well as some of a different construction, have been recommended. Among the latter may be mentioned a contrivance which consists of a strong cord, which is to be passed round the neck, and then, by a saw motion, is carried to and fro by means of cross handles at its extremities, until the head is severed. It is probable that a modification of the wire-rope écraseur might be advantageously used for the same purpose, but the difficulty in such cases would probably be the passing of the rope round the neck. It would appear that, with the ordinary instrument, a cutting surface is by no means absolutely essential, as some have succeeded by means of the ordinary blunt hook. The operation of decapitation by Ramsbotham's hook or Braun's "decollator," is described by Dr. Barnes as consisting of three stages. The first stage is the application of the decapitator and the bisection of the neck; the second is the extraction of the trunk; the third, the extraction of the head.

The first point to be accurately ascertained is the position of the body of the child, whether dorso-anterior or dorso-posterior. This being determined, in the manner already described, by an observation of the hand of the fœtus, and the woman having been placed in the ordinary obstetric position, or on her back, the arm of the child is to be firmly pulled downwards, so as to bring the neck, as far as is practicable, within the reach of the operator. The arm is then to be intrusted to an assistant, whose duty it is to maintain the position by steady and moderate traction. The bladder—and, if it be necessary, the rectum—are now to be emptied of their contents, and the hands and hook smeared with lard or oil. The

fingers of one hand—right or left, according to the position—are then gradually insinuated in a direction corresponding to the anterior surface of the child, so as to reach the front of the neck. With the other hand the operator then introduces the hook, "laying flat," says Barnes, "between the wall of the vagina and pelvis and the child's back, until the beak has advanced far enough to be turned over the neck. The beak will be received, guided, and adjusted by the fingers of the left (opposite) hand. The instrument being *in situ*, whilst cutting or breaking through the neck, it is still desirable to keep up traction on the prolapsed arm. In using Ramsbotham's hook, a sawing motion must be executed, carefully regulating your action by aid of the fingers applied to the beak. If Braun's decollator be used, the movement employed is rotatory, from right to left, and at the same time, of course, tractile. The instrument crushes or breaks through the vertebræ. When the vertebræ are cut through, some shreds of soft parts may remain. These may be divided by scissors, or be left to be torn in the second stage of the operation—the extraction of the trunk."

The delivery of the trunk and limbs of the child is now to be effected, mainly by pulling upon the arm; but, should the force requisite be considerable, it will be proper to pass the blunt hook into the axilla of the opposite side, in order to economize the tractile force on the depending arm. Care must, however, be taken not to use the hook with too great force, as by causing the premature descent of the upper shoulder we would throw the great diameter of the shoulders across the pelvis, and thus, it may be, render the extraction of the trunk a matter of increased difficulty. Generally speaking, no great difficulty, in the absence of pelvic deformity, will be encountered in this stage of the operation; and steady traction will cause the shoulders, trunk, and breech, successively to pass along the pelvic canal. The head, if completely separated, will move to the side, and will be no obstacle to the passage of the body.

The extraction of the head of the child, which constitutes the third stage of the procedure, is by no means an easy operation, and is sometimes, in fact, the most difficult point of all. A good deal will depend upon the condition of the uterus as regards contraction. During the second stage, it will be the duty of an assistant to keep up steady pressure upon the fundus of the uterus, and to follow it downwards as the trunk is being gradually expelled, so as to encourage, as far as may be possible, efficient and symmetrical uterine contraction, under the influence of which the head will be grasped, forced down in the direction of the cavity, and maintained in a comparatively fixed position. Another condition likely to exercise an important influence is the state of the head itself, which, if decomposition has advanced, will be easily compressible, the flat bones being so loosely connected with each other as to admit of overlapping to a very unusual extent. Various methods have been suggested and practised for the extraction of the head from the uterus. The instances in which it is expelled by the natural efforts are few, and no confidence can, for obvious reasons, be placed in the occurrence of such a result. In some cases, it has been successfully removed, when compressible from putrefaction, by the fingers of the operator; but, in almost all ordinary cases, instrumental aid is required, when we have the forceps, the blunt hook, the crotchet, and the cephalotribe to select from.

The great obstacle, in such cases, arises from the mobility of the head, which rolls about within the cavity, and can sometimes only be seized with difficulty. If, however, the head can be steadied and pressed downwards by the assistant, whose hands are employed for this purpose in the hypogastric region, the difficulty in question may be overcome. If it be possible to fix the crotchet, or a small blunt hook, in the foramen magnum or orbit, success may, in this way, with the aid of the fingers, be quite practicable; but the risk of the crotchet slipping is so considerable, that the more experienced modern operators have pretty much discarded that instrument in favor of the others which have been mentioned. The safest and most satisfactory operation, when it is practicable, is that by the ordinary midwifery forceps. The difficulty in this, as in the other operation, is to fix the head; for, as soon as one blade is introduced, the head may escape to the upper part of a relaxed uterus, or to either side, so as completely to elude the grasp of the blades; but if we can succeed in seizing the head, either anteroposteriorly or latterly, delivery will usually be completed without any further obstruction. The only other point to which it is necessary to pay particular attention, is the adjustment of the blades in such a manner as may obviate the possible danger arising from jagged spicula, which may project from the several vertebræ, or from such splintering elsewhere as may possibly have been the result of previous operative efforts.

There are cases, however, in which much more serious difficulties attend the extraction of the retained head. The worst examples of this are instances in which there is pelvic deformity, and in which it may be quite impossible for the ordinary diameters of the head to pass. In these, and in the more difficult of the cases unconnected with pelvic distortion, it has been suggested that the perforator should be used. It is to be feared, however, that even in the hands of the most skilful, great risk will attend the use of that instrument; and, even if it were not so, it must be admitted that the operation is one which we would not, without great apprehension, intrust to the inexperienced. Hazardous as the perforator always is, it is in this instance peculiarly so, owing to the mobility of the head, in consequence of which it may rotate suddenly and unexpectedly at the moment of perforation, and thus direct the sharp point of the instrument against the uterine wall with possible results too fearful to contemplate. If we are able, by means of external manipulation, to fix the head against the brim, the perforator may be successfully employed against the occiput; but, as mere pushing force would most likely dislodge the head, it is proper to combine boring with the more violent effort, which will, certainly, in economizing the latter, conduce to the safety of the operation generally. After perforation, and evacuation of the contents of the cranium by a process exactly similar to that which will be described under the head of Craniotomy, the extraction of the head by the guarded crotchet, or, still better, by the craniotomy forceps, will be a matter of no great difficulty; but, in both cases, the greatest possible care should be taken, as the head descends, to preserve the soft parts from laceration by the splintered fragments of the bones. The Cephalotribe is an instrument for which, in the management of such cases, we must express a very decided preference, as being both safer and surer than either the perforator or the crotchet, and almost as simple as the forceps in its application and management, as will be hereafter explained. And, after discharging its special office of crushing the head, which is of such importance in contraction of the brim, the cephalotribe may further be employed as an extractor.

It is not only as a sequel to the operation of decapitation that extraction of the head has to be effected; but it is also sometimes required under other circumstances, such as its accidental separation after the operation of turning. This is not likely to occur in experienced hands, but the separation of the neck of a putrid child does not require much force, and might happen to any one. Far less excusable are the cases in which in a breech presentation, or after turning, the head is arrested at the brim, and such violence is used in attempts at extraction as to result in tearing the trunk away from the head. In the absence of evidence of the death of the child, it is scarcely to be conceived that any one would use such violence as would of itself sacrifice the life of the child. But, if the child be dead, the operator might imagine that this is the safest and most natural method of delivery, and act accordingly by employing an amount of force which, in the interests of the mother, is quite unjustifiable, even should he succeed in his endeavor, seeing that he has, in the forceps and the perforator, agents by which maternal risk is materially reduced.

CHAPTER XIX.

TURNING.

The operation of Turning, in its most extended sense, implies a manœuvre by which one of the poles of the long diameter of the child, which has not originally been the presenting part, is brought into the brim of the pelvis, the long diameter of the fœtal oval being thus made to correspond to the long diameter of the uterus. Two varieties of turning may therefore be practised: these are turning by the head, or, as it is generally termed, Cephalic Version; and turning by the feet, or Podalic Version. A special modification of the latter, in which the breech, and not the feet, is brought down, has been occasionally practised, and separately described.

From the time of Hippocrates down to the middle of the sixteenth century, cephalic version was almost exclusively practised, the head of the child being assumed to be the only natural presentation. This assumption led to the frightful practice of turning by the head in all presentations of the pelvic extremity. It is quite clear that both Aristotle and Celsus held more correct views; but the practice of Hippocrates, nevertheless, held its ground until the period which we have mentioned; so that, up to that time, the ordinary operation of podalic version, as practised in the present day, was quite unknown. In 1561, Pierre Franco, in a work devoted chiefly to surgery, suggested the mode of turning by the feet, and this was subsequently adopted by Paré, Guillemeau, Mauriceau, Baudelocque, and Lachapelle, to the complete exclusion of the cephalic operation. The difficulties which, under certain circumstances, surround the modern operation, seem, as late as the end of last century, to have suggested doubts as to its propriety in the minds of Flamand, Osiander, and other distinguished accoucheurs of that time, who therefore suggested that the practice of Hippocrates should be resorted to in all but original presentations of the breech or feet, to the exclusion, absolutely, of the new method. These views found favor chiefly in Germany, but the podalic method made steady progress, and came ultimately to be generally adopted. The contemptuous manner, however, in which cephalic version was passed over or condemned by many of the most eminent writers of this later period, led for a time to the complete abandonment of this process in favor of podalic version: but, in the present day, its value finds general recognition in a certain class of cases—limited, no doubt, in point of numbers, as will be more particularly shown in the sequel.

What is now, however, universally described as, *par excellence*, the operation of turning, is podalic version, which consists in bringing down one or both feet when another part presents, and thus converting it into a footling presentation. The circumstances which call for this operation embrace a large proportion of all cases in which a speedy delivery is required, and especially those in which the necessity has arisen early in the course of labor. Among the circumstances thus alluded to, may be mentioned placenta prævia, prolapse of the cord, sudden death of the mother, certain cases of rupture of the uterus, and, in the opinion of many, cases of moderate pelvic distortion, in which it has been proposed as a substitute for the forceps, or the more formidable operation of craniotomy. In transverse or shoulder presentations, again, it is the invariable procedure; and, in so far as this particular case is concerned, it has already been described at some length.

It is of the first importance that the conditions favorable to the operation should be correctly appreciated. As it is usually performed, it is essential that the os and cervix should be sufficiently dilated to permit of the passage of the hand; but, as a moderate degree of dilatation only is requisite for this, it follows that turning is available at a stage of labor considerably earlier than we have seen to be necessary for the safe employment of the forceps. Another favorable condition applicable alike to all cases is, that the membranes should be intact. The reason of this is obvious; for, so long as the liquor amnii remains, the walls of the uterus are separated, in proportion to its quantity, from the body of the child, the mobility of which is consequently greater. Nothing, indeed, contributes so much to the ease with which turning is effected as this; and, if the waters have escaped, and the womb has thus been permitted to grasp the body of the child, the operation is then found to stand in a very different category. The condition of the os as regards *dilatability* is another most important consideration, for a rigid or unyielding condition of this part of the passage is justly looked upon as an unfavorable circumstance, and it is therefore proper to wait, so long as the membranes remain unruptured, until nature overcomes this resistance.

The Operation.—The condition of the bladder and rectum having been attended to, the woman is, in the first instance, to be placed in a convenient position. Some operators prefer that she should be on her back, and others that she should be on her elbows and knees; but the English operator will generally choose the ordinary midwifery position on the left side, the nates being brought to the edge of the bed, so as to be within convenient reach. She should then be brought under the influence of chloroform, or some other anæsthetic. This has the effect of facilitating, both directly and indirectly, the passage of the hand, by overcoming rigidity and spasmodic contraction, and obviating the embarrassment which may arise from movements which are the result of apprehension or pain. The uterus is to be supported by an assistant, or by the other hand of the operator. By this means valuable assistance is afforded, by movements which are made in concert so as to bring the lower extremities of the child within reach.

The directions which are often given as to the hand which should be employed are of little practical value. Indeed, it is impossible in some cases, as in placenta prævia, to recognize, before it has been passed into the uterus, the conditions which are held to indicate the use of the right hand or the left. Most people can act much more efficiently with the right than with the left hand, and there is no possible direction within the pelvis in which the right may not be passed. The positions in which there is most difficulty are those in which it may be necessary to direct the hand, with the palm forwards, towards the left sacro-iliac synchondrosis while the woman lies in the ordinary position on her left side. In this case the hand must be pronated to the fullest extent; and, if this movement of pronation is increased, as it may be by the operator turning his back towards the patient, it will pass without difficulty. The left hand would undoubtedly serve the same purpose here, if we could be sure of equally efficient action with it after the introduction. If the operator is left-handed, he should use the left hand in preference to the right; and as our first object

is to attain the abdominal surface of the child—which, in the great majority of all positions, lies towards the back of the mother—and as it must clearly be easier to pass the left hand along the sacrum than the right, the left-handed operator has a certain advantage. For the same reason, he who is ambidextrous should use that hand which may best suit the position of the child; but, if the position be doubtful, he should invariably select the left, as being more likely to conduct him to the anterior surface of the child's body, while at the same time the flexion of the fingers will correspond to the axis of the pelvis.

The operator should take off his coat, and bare his arm, so as to obviate, as far as is practicable, any inconvenience which may arise from pressure upon the muscles. The hand and arm are then to be liberally smeared with lard, and the points of the fingers, which are brought together like a cone, are introduced within the vulva, and steadily pushed upwards in the axis of the outlet. In the event of unusual contraction at this stage, the obstacle will, to some extent, be overcome by separating the fingers, so as to stretch the parts. No such difficulty, however, usually exists, but a more important one is encountered as the knuckles approach the orifice of the vagina. This is increased by the action of the constrictor vaginæ muscle, especially in cases in which anæsthetics are not employed; but the resistance, by the stretching action of the fingers, combined with moderate and unremitting pressure, will speedily be overcome, when the rest of the hand will pass into the vagina, the muscles retracting upon it as it advances, and ultimately grasping the wrist. It is at this stage proper to pause, which affords us an opportunity of more carefully examining the presenting part, and, it may be, of ascertaining the direction in which the hand is to be passed, with greater certainty than can be attained by the finger only.

The operator, bearing in mind the curve of the pelvic axis, now alters the direction of his hand, so that its advance may coincide more with the axis of the brim. His subsequent procedure will depend chiefly upon the condition of the os. If it is well dilated, soft, and distensible, the hand may be passed at once, and turning will probably be effected with such ease as may astonish the inexperienced. But, if the os be comparatively undilated, or in any degree rigid, he must proceed more warily, so as to avoid the slightest approach to violence—introducing first one, then two, and subsequently the remaining fingers, in the most cautious manner possible. It is generally said that, to warrant an attempt at turning, the os must be dilated to the extent of a crown-piece. This is, of course, only intended as an approximation; and as much or more will depend on the dilatability, as upon the stage of actual dilatation.

If the membranes are still unruptured, another object in avoiding abruptness in manipulation is to preserve the membranes intact. With this in view, therefore, we direct the fingers, so soon as they have passed within the os, between the uterine wall and the external envelope of the ovum; and, the connection between those parts being lax, no great difficulty is generally encountered in passing the hand upwards, without rupturing the membranes, in the direction of the feet.

No part of this process is, however, to be attempted, without reference to the natural expulsive efforts. If the uterus is acting in the usual manner by rhythmical contraction, we should choose the period of relaxation for the advance of the hand; but, so soon as the advent of a pain is announced by contraction of the uterine walls, the hand should be allowed to lie quite flat and inactive, with the palm towards the child, until the period of relaxation marks the moment when our efforts may be safely resumed. Any attempt at continuous effort is wrong in principle, and is, we may be sure, apt to cause laceration, and even rupture of the uterus. This rule is one which is not observed in practice so strictly as it ought to be, and the wonder is, that accidents are not more frequent than they actually are, in cases where force is employed by the operator with no reference whatever to anything save the resistance which he encounters. It will, however, as must be confessed, often be found that the stereotyped direction to act during an interval, and pause during a pain, cannot well be adopted, for the simple reason that the contact of the hand excites the uterus to continuous, or at best remittent action, so that if we are to wait for absolute inaction on the part of the uterus, we may abandon the effort altogether. Such continuous or spasmodic action as this, may be, as we have seen, allayed by anæsthetics; and, if it should persist, we may still succeed, although it is necessary, in such instances, to act with redoubled caution and deliberation.

As soon as the hand has reached so high in the uterus that the inferior extremity of the child can either be felt, or may be assumed to be on the same level, the sac of the liquor amnii may be ruptured, and the fingers passed in the direction of the foot or knee. A too strict observance of this rule, is, however, undesirable; for example, when the foot or knee is lower in the uterus than usual, we might then advance the hand further than is necessary, and, of course, if we come upon the edge of the placenta, the membranes must be pierced at once. The rupture of the membranes is easily effected, by an effort of the fingers or the action of the nails in the direction of the fœtus; but with this the mechanical advantage of the liquor amnii is not lost, as it is still retained by the efficient plug formed by the arm which occupies the os uteri. This renders the actual version an easy matter. The fingers of the operator lay hold of a foot or a knee, which in withdrawing his hand, he brings with him, choosing, if he can, a moment of uterine rest for the purpose, and availing himself, if it be necessary, of the assistance of the other hand, which is to be applied externally. As this is being done, the original presentation retreats from the lower segment of the uterus, so that the turning part of the operation is complete.

Much argument has been wasted as to the propriety of bringing down one leg or two. The sound rule in practice is, that when we succeed in securing one foot, we should never pause to search for the other; as one is all that is necessary, unless, perhaps, in cases of pelvic deformity, which we shall afterwards more particularly allude to. Nay, more than this, the descent of one leg has a positive advantage as compared with two, as thus, by increasing the diameter of the pelvis of the child, the parts are more thoroughly dilated, so as to admit of the ultimate passage, rapidly, and with comparative safety, of the head of the child. And, as this is the stage at which the life of the child is most frequently compromised, it is assumed, that by abridging its duration, fœtal life in the aggregate must, by this process, be saved. Still, when a very rapid delivery is desired, the operator knows that he has a better and more efficient hold upon two limbs than he can have upon one; and he will, therefore, very naturally, bring down both when they are within easy reach; but, when the discovery and seizure of the other limb involves extra effort or delay, not even in such a case as this should he be otherwise than content with what he has already achieved. The foot or knee which is lowest in the womb or easiest of access should at once be seized; but in a transverse presentation, there is no doubt that turning will be more easily effected when we seize the leg of the side opposite to the presenting shoulder.

Fig. 115.

Podalic Version.

Constriction of the vaginal orifice, and incomplete dilatation of the os, are, as we have seen, difficulties which are often encountered

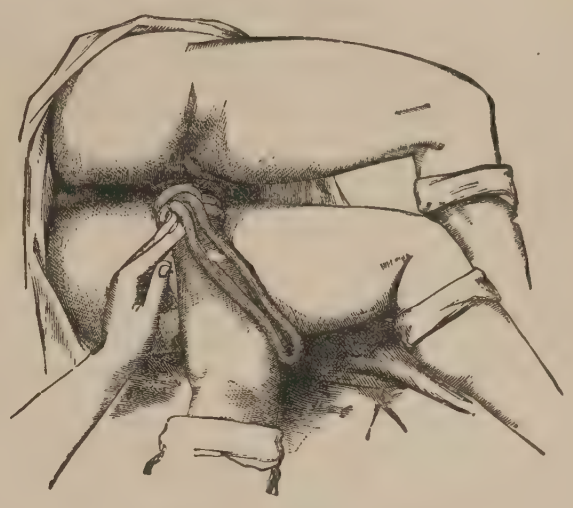
in attempts at turning. Far more serious than those are the obstacles which we meet with, when the conditions which we have indicated as favorable to the operation do not exist. A case, for example, may be brought under our notice for the first time at an advanced period of labor, in which the os has been permitted to dilate, the membranes to rupture, and the presenting part to descend in the pelvis before the nature of the case has attracted particular attention, or the necessity for turning has been recognized. The most familiar illustrations of this are shoulder presentations, already described. In such cases, the liquor amnii has, we shall suppose, long since escaped; the uterine walls have grasped the child in a firm embrace; and the long-continued uterine action has forced the shoulder down into the cavity of the pelvis. If pelvic distortion should exist, impaction may have taken place; but, independent of this, mere tonic uterine contraction may so wedge the head as to render the case practically as bad as one of real impaction. In such cases, the difficulties are often insurmountable, for the operator cannot even pass his hand beyond the presenting part, and is obliged to desist, or have recourse to some of the other operations of midwifery. It is perfectly impossible to describe what experience alone can teach—the amount of force which, in this, or any other stage of the operation, we are warranted in employing. Anything even approaching to what we would call violence, is not only improper, but ineffectual, so that moderate and sustained effort, combined with an insinuating movement of the fingers, should always be preferred, as being comparatively both efficient and safe. If, for example, we were rudely and recklessly to thrust the hand into the vagina without observing the precautions we have detailed, we should, in all probability, inflict severe laceration on the parts; but if, on the contrary, we act with caution and discretion in a case precisely similar, we effect our purpose with ease and safety. The same principle obtains, and should never be lost sight of, in all the subsequent stages.

Impaction implies resistance from the pelvic walls; but we have obstacles of a not less insurmountable kind in the rigid condition of the os or uterine walls, when, although success by violence may be possible, it is only to be effected by what involves serious risk to the mother. It is such considerations, therefore, based on general principles, which should be our guide in practice, and deter or encourage us in an individual case. It not unfrequently happens, as practice has taught every experienced accoucheur, that these successive stages of difficulty have been, one by one, surmounted, and yet, at the very moment when success seemed just within our grasp, further progress was arrested. The tips of the fingers may even touch the knee or foot, and yet the inch or so of further advance which is required can scarcely, by any moderate effort, be achieved. This is a moment at which, in our eagerness, we are very apt to pass the line which separates prudence from rashness. By a vigorous thrust of the arm, we may be confident that we shall attain what we so much desire; and it is with difficulty only that we can refrain from what alone seems wanting to complete success. We must, however, with firmness and what we may term self-denial, resist this inclination, and wait a little until, perchance, we may wear out the uterine resistance which constitutes the barrier to our progress.

It is here, however, most unfortunately, that the straining of the fingers is apt, along with violent uterine contractions, to cause cramp of the muscles of the hand, a condition which may absolutely paralyze our efforts. By resting for a time, or stretching the fingers, the power of the hand may return; but it too often occurs that we find ourselves quite powerless just at the moment when we have come to count upon success crowning our efforts. Nothing will remain for us, in such a case, but the withdrawal of the hand, to our great chargin, and either the introduction of the other, or the re-introduction of the same one after it has had time to recover. What is particularly annoying, when this is found to be necessary, is that the withdrawal of the hand from the uterus permits of the escape of what liquor amnii remains, and, consequently, of a still greater degree of uterine contraction upon the body of the child. Even in such a case, however, we may ultimately succeed by perseverance; and, when the hand has again been introduced, our external manipulations may result in bringing the feet within reach. But, with this measure of success, our difficulties may be far from being at an end.

It sometimes happens that the hand is introduced, the foot seized and brought down to the os, and yet complete version cannot be effected. When the presence of the liquor amnii, or a relaxed condition of the uterine walls, permits of a certain degree of freedom of motion, the presenting part will recede as the foot is pulled

Fig. 116.



Turning by the Noose or Fillet.

downwards to the os. But, when the body of the child is firmly grasped by the uterus, this is not the case, and some further manœuvring, external or internal, will be required to complete the operation. The mode of acting externally through the abdominal walls has already been alluded to, and will again be more particularly described. The internal manipulations in these cases consists in pushing up the presenting part while we pull down the foot. In other words, we act upon the two poles of the long diameter of the fœtus instead of one only. The vagina, however, being already fully occupied by the hand of the operator, it will be impossible for him to act upon the presenting part without letting go the hold which he has of the foot; but this is of all things what he least wishes to do, as there is often great difficulty in securing it again. By a very simple expedient he is able to effect all that he desires. A running noose of tape or cord is to be passed over the forearm, and is then pushed upwards over the hand and beyond the os calcis and instep of the foot. When tightly drawn, this secures an admirable hold, and the hand may be withdrawn, or at once brought to bear upon the head or presenting part, while the other hand pulls steadily upon the noose. The same principle has been adopted, by Braun and other eminent Continental practitioners, when difficulty arises in seizing the foot, and various instruments have been devised by them with this purpose. One of these is described by Hyernaux of Brussels, under the name of *porte-lacs*. When such combined action upon the two extremities of the child fails, it may be impossible to effect delivery in this way; so that we may have to fall back upon the perforator or decollator, as the case may be. Before finally abandoning the attempt to deliver by this method, we must be sure that we have pulled down the foot in the proper direction, so as to turn the child *forwards*. An error here is not likely, as we would naturally pull the foot, when seized, directly towards the os; and if we have passed the hand along the abdominal surface, we can scarcely go wrong; but it is quite possible that, by omitting this precaution, and passing the hand over the dorsal surface, we may not only find it vastly more difficult—if, indeed, it be possible—to reach the foot, but we may discover, in addition, that when it is reached and seized, turning is impracticable after all.

It is generally recommended by systematic writers, that we should so manage the operation as to make sure that the abdomen of the child is turned, after version, towards the spine of the mother, as is indicated by the toes being directed towards the sacrum. This is, however, by no means a matter of such importance as it might appear, for if, as often happens, the toes should be pointed to the symphysis pubis, the trunk of the child will rotate as it descends, so as to bring the face ultimately into the hollow of the sacrum, whatever the original position may have been. But, when the natural rotation has not taken place, it has been found necessary to assist the movement by manual interference. The greatest caution must, in every case, be exercised to prevent, as much as may be possible, pressure upon the cord; but, in so far as this is concerned, what has already been said in regard to presentations which are originally of the pelvic extremity, will serve for our guidance in those cases in which the pelvic end of the fœtal oval is artificially, and for a particular purpose, brought down. One advantage of effecting version, so as to bring the dorsal surface to the front, will be to bring the cord naturally into the posterior part of the pelvis from the first, by which we are enabled to place it in that situation in which it is least likely to be subjected to severe pressure.

When version is complete, we have converted the case, whatever it may originally have been, into a presentation of the feet. It remains, however, for consideration, whether we are to leave the case to nature, or proceed to immediate delivery. It is almost always proper to pause, at least for a time, until we see what nature is likely to do; but, if the symptoms are such as to call for prompt action, whether in the interests of the mother or the child, we must act boldly, and without hesitation, in effecting immediate delivery. It should be remembered, that so long as the head of the child remains above the brim, the cord is not likely to be subjected to any dangerous pressure, so that, while nothing is lost by delay at this stage, something may be gained by pausing until uterine energy is awakened. If the cord has prolapsed, or has otherwise come within reach, at this or a subsequent stage, we will be guided by the presence or absence of pulsation, and the other evidences of vitality of the fœtus, in determining whether to precipitate matters or not. During the descent of the trunk, we must observe the usual precautions, but at the last stage there must be no delay, and the forceps and restoratives should be at hand, so that we may at once have recourse to them should occasion arise, and that in the manner described in the chapter on Pelvic Presentations.

The term Pelvic Version, as employed by English writers, implies an operation in which the breech, and not the feet, is brought to the os when another part originally presents. That this may, in rare instances, be effected by dexterous management, does not admit of dispute; but, at the same time, such a course of procedure is so obviously one of greater difficulty, as compared with podalic version, that we need not wonder that the former operation, which, indeed, never attracted much notice, has been all but entirely superseded by the latter. As regards the ancient operation of Cephalic Version, it seems certain that there are cases of transverse presentation in which we would be justified in making an attempt at what is a less severe operation to the mother, by pushing up the shoulder, and so manipulating as to cause it to be replaced at the os by the head. Success could here only be hoped for when the child is still movable within the uterus, and the methods most likely to be attended with success are either the "bi-manual" or "bi-polar" method, or Dr. Maxson's postural method, both of which will be afterwards described.

The application of the operation of ordinary or podalic version to cases of pelvic contraction, is a mode of procedure which was practised long before the forceps was discovered. Nor did the discovery of that important instrument throw the earlier operation entirely into the shade; and, indeed, we find Denman, and other contemporary writers, giving minute directions, a hundred years ago, as to the manner in which the operation is, under such circumstances, to be effected. There can be no doubt, however, that as operators became more skilled in the use of the forceps, and the scope of that instrument became more thoroughly understood, the number of cases of contracted pelvis in which turning was practised, was more and more diminished in number, until, at last, the operation fell into complete disuse. The operation was, however, revived and strenuously advocated by Simpson; and, although some experienced operators have condemned it, it is the fact that many of the most distinguished living accoucheurs have adopted his views and practice. Simpson maintained his position by arguments and facts,—the former being characterized by the ingenuity and ability which he possessed in such a high degree, and of which his works afford no more striking illustration.

The fact that this operation involves a question of conservative midwifery, is one which may alone suffice to secure for the subject earnest and careful attention; and this, indeed, it has received from almost all recent writers. In cases in which the head is arrested by pelvic contraction at the brim, we have three possible modes of action between which we must decide—turning, forceps, or craniotomy. The first two are conservative, the last destructive. The dangers and difficulties of the long forceps are well known, and have been fully described; but there are, probably, few operators who would not rather risk them than wantonly destroy a living child, as we have too good reason to believe has often been done. The case is quite different when the child is dead; for here we determine upon a plan of action which we undertake solely in the interests of the mother, when craniotomy stands before us under quite another aspect. The first point of importance, then, is to determine whether or not the child is alive; and if, this being established, we fail to deliver by the long forceps, or that instrument is contraindicated, the question before us simply is:—Shall we turn, or perforate—attempt to save the child, or at once destroy it?

The reply to this question, involving as it does such weighty responsibility, will depend upon a variety of circumstances, of which the most important, perhaps, is the degree of pelvic distortion which actually exists. It is impossible to fix the exact measurement of the conjugate diameter which may be held to warrant an attempt at turning; and, even were it possible to determine this with fractional accuracy, our modes of practising pelvimetry are so uncertain, that it is a matter of the greatest difficulty, even to the most dexterous, to gauge a pelvis during labor. Dr. Churchill fixes the limit at two inches and six-eighths, and Dr. Barnes—as we believe, with more justice—at from three and a quarter to three and three-quarter inches; so that we may say, in round numbers, that when the conjugate diameter is less than *three inches*, to attempt to turn would be to subject the woman to needless risk, as we may be confident that nothing but failure could attend our efforts.

But, seeing that this is a question where an eighth of an inch may make all the difference between success and failure, and it is impossible to ascertain the exact space with anything more than what is at best an approach to accuracy, it follows, as a possible contingency, that we may actually turn, and subsequently find that we have miscalculated either the conjugate diameter or the size of the head, and that the latter will not pass. Such a failure as this is not so serious a matter as might at first sight appear; for if we have thus to resort ultimately to craniotomy, that operation will be attended with very little more difficulty and no greater risk than if we had begun by perforating the vertex. The mother, no doubt, has been subjected to the risks of turning in addition to those of craniotomy, but we are surely warranted in incurring this additional risk in the hope, if successful, of saving the child.

The bi-parietal measurement of the head is, as he points out, greater than the bi-mastoid; and as, in turning, the latter enters the contracted space first, he argues that, on obvious mechanical principles, the *compressibility* of the head is increased by version; and, as it is well known that in some cases of this kind, when the child has been born alive, the parietal bones have been found to be flattened or indented by the pressure, he concludes that turning under such circumstances is not only a reasonable proposal, but an actual gain in facility of delivery and safety to the child. Simpson's theory has been contested by McClintock, E. Martin, and

others, upon the whole, we think, unsuccessfully; while in corroboration of his views, a considerable weight of practical evidence has accumulated, of which the following from Barnes' lectures is a striking illustration: "In the first place, let me state a fact which I have often seen. A woman with a slight contracted pelvis, in labor with a normal child presenting by the head, is delivered, after a tedious delay, spontaneously or with the help of forceps; the head has undergone an extreme amount of moulding, so as to be even seriously distorted. The same woman in labor, again, is delivered breech first; the head exhibits the model globular shape, having slipped through the brim without appreciable obstruction. In the second place, I have, on several occasions, been called to an obstructed labor in which the head was resting on a brim contracted in the conjugate diameter. Of course, nature had failed; the *vis à tergo* was insufficient. I have tried the long double-curved forceps, trying what a moderate compressive power, aided by considerable and sustained traction, would do to bring the head through, and have failed. I have then turned, and the head coming base first, has been delivered *easily*. Upon this point I cannot be mistaken."

The operation of turning in contracted pelvis may thus present itself to us under two distinct aspects—as a substitute for the long forceps, and as a substitute for craniotomy. As regards the former, the experience of many independent observers would seem to show that, on the principle suggested by Simpson, turning may succeed when the forceps will fail; that instrument being, therefore, applicable to those cases only in which the contraction is moderate in degree. Owing to the difficulty of ascertaining the exact dimensions of the head and pelvis, a safe, and, we believe, a very general practice, is first to make a cautious attempt with the long pelvic-curved forceps, and failing that—which, in skilful hands, is a safer operation to the mother—to proceed at once to turn. Turning as a substitute for craniotomy is a more important point still—so important, indeed, in a conservative sense, that it cannot fail to command the attention of every conscientious practitioner. Impaction of the head, or difficulty of displacing it, so as to admit of the passage of the hand, and a degree of pelvic contraction beyond the limit which we have stated, are the two principal contraindications of the operation of turning. The death of the child is not necessarily so, for craniotomy at the brim is by no means so safe an operation but that it may fairly be balanced against turning, even in the interests of the mother alone.

Fig. 117.

Malacostean Pelvis.

The operator must be prepared, in turning in a contracted pelvis, to encounter special difficulties in individual cases, which it is impossible fully to describe, or even to anticipate. Following the example of all writers on the subject, we have alluded to the operation in reference only to simple conjugate contraction at the brim, by far the most common of all the varieties of distortion. It requires no argument to show that rules applicable to this alone must often fail. In the typical malacostean pelvis we may find an actual increase in the conjugate diameter, coupled with such deformity as may render craniotomy, or possibly the Cæsarean operation, the only practicable methods of delivery. In those cases in which there is a symmetrical distortion, it is of importance that the large or occipital end of the head should, if possible, be thrown into the larger half of the pelvis. To effect this is, however, a matter of very considerable difficulty; and we apprehend that the rules laid down by E. Martin and others for effecting the object cannot be held as being of much practical value. The accoucheur must in no case lose sight of the infinite varieties of distortion to which allusion has already been made, as these may at any time call for special adaptations, to which thorough operative capacity and an intimate knowledge of the subject can alone guide us. Another possible difficulty we have known to occur in connection with twin pregnancy, in which the operator, after introducing his hand, has seized the foot of the wrong child.

The operation to which alone we have hitherto alluded is the ordinary operation of turning, necessarily involving the introduction of the whole hand within the cavity of the womb. There is, however, another operation, or rather a modification of this operation, which may be practised with less risk to the mother, and even, as it would seem, under circumstances which would render the ordinary procedure difficult, if not impossible. This is *Bi-manual* or *Bi-polar Version*, an operation which is attracting, year by year, more and more of the attention which it merits. Early in the present century, Wigand suggested a method whereby the presentation of the child could be altered without the slightest risk to the mother, by external manipulation alone. His observation applied to transverse presentations only, and his plan was,—having ascertained, by vaginal examination, the exact position of the fœtus,—so to press upon the child externally as to bring to the os uteri that pole of its long diameter which was lowest in the pelvis. In a word, he claimed to be able to practise both cephalic and podalic version, without even introducing a finger into the vagina, although he seems to have employed the inner hand to guide or receive the head or breech into the os. The directions which he gives include elaborate, but, we fear, impracticable, instructions as to the manner in which we should proceed—with the view of availing ourselves, to the utmost, of gravitation—to place the patient, now on one side, and again on the other—at various successive stages of the operation. It is quite certain that Wigand never contemplated anything more than partial version, so that his novel manœuvre, which found considerable favor in Germany, was never supposed to be applicable to cases of placenta prævia, nor to any other case in which the head was originally the presenting part.

Dr. Robert Lee seems to have been the first to suggest a method of turning, which is the opposite of that to which Wigand lent the weight of his authority. In cases of incomplete dilatation of the os uteri, he brought two fingers, which he passed into the uterus, to bear upon the head, which he first of all attempted to displace; and, when he had succeeded in this, he successively pushed aside those parts which came opposite the os in the same direction as that in which the head had disappeared, until, ultimately, the feet were made to present, or were brought within reach of the finger, and so secured. It is to Dr. Braxton Hicks that we in this country owe the method of combined external and internal version, although, as has already been stated, the claim of priority has been made out in favor of Dr. M. B. Wright, of Cincinnati. This procedure bids fair to supersede, in a great measure, the old method, and we can unhesitatingly, and from personal experience, vouch for its efficacy in practice. The conditions which have already been mentioned as favorable to ordinary podalic version, are even more essential to the successful performance of the bi-polar method. Unless, therefore, the child is movable with tolerable freedom within the uterus, we can scarcely expect to succeed in effecting version by this, as we should probably fail by the other method. But, until we have thoroughly tried the effect of anæsthetics in reducing rigidity and tonic contraction of the uterine fibre, we should not too readily abandon the chance which this operation may possibly afford us, and we may be sure that if, at any stage, the conditions which are generally considered to be favorable to the ordinary operation are manifested, we may hope to succeed by this process. The bi-polar operation is, as will be

inferred, a combination of the methods of Wigand and Lee, in the course of which, while the operator brings one hand to bear upon the uterus through the abdominal walls, he simultaneously operates upon the other end of the child by means of the finger, which he has introduced into the vagina and through the os uteri, causing the one pole to descend, as he encourages the other to recede.

In so far as transverse presentations are concerned, we are indebted to Dr. Robert Lee for having first clearly pointed out that when the child is situated quite transversely within the womb, its knee is generally within a finger-length of the os uteri, and thus in some transverse presentations it is not very difficult to hook down the knee. The child, however, as both he and Wigand have shown, does not usually lie transversely, but rather obliquely in regard to the transverse axis of the uterus, which removes the knee to some extent from the immediate grasp of the finger, and brings at the same time the operation of cephalic version somewhat more within the range of possibility. But, while we thus recognize, as we can scarcely fail to do, the advantage of the bi-polar method over either of those in which one pole only is acted upon, the former admits, as will be seen, of a far more extended application, such as was never sought to be accomplished, so far as we can see, either by Wigand or Lee. In cases of placenta prævia, therefore, or in cases of contraction of the brim of not less than three inches in the conjugate diameter, the head being the presenting part, it is quite possible, and in some instances by no means difficult, to effect complete version by the bi-manual method, and thus avoid many of the risks of the ordinary operation. For the details of this procedure we shall here quote the directions of Dr. Braxton Hicks.

Fig. 118.

Bi-Manual Version: First Stage.

"I will now proceed to describe the mode by which I effect podalic version. We will suppose a case where everything is natural; the os uteri dilated to admit one or two fingers, membranes perfect, and the face towards the right side. The patient may be placed in the ordinary obstetric position. Having lubricated my left hand, I introduce it as far into the vagina as is necessary, in order to reach a finger's length within the cervix. Sometimes it requires the whole hand, sometimes three or four fingers will be sufficient in the vagina. Having clearly made out the head and its direction, whether to one side or other of the os uteri, I place my right hand on the abdomen of the patient towards the fundus; I then endeavor to make out the breech, which is seldom a difficult matter. The external hand then presses gently but firmly the breech to the right side; as it recedes, so the hand follows it either by gentle palpation, or by a kind of gliding movement over the integuments, while at the same time the other hand pushes up the head in the opposite direction, so as to raise it above the brim. It may be mentioned that, when the head has descended a considerable distance into the pelvic cavity, or more than half way through the os uteri, it is scarcely possible to lift it above the brim, especially if the uterus be active.

"When the breech has arrived at about the transverse diameter of the uterus, the head will have cleared the brim, and the shoulder will be opposite the os. That is pushed on in like manner as the head, and after a little further depression of the breech from the outside, the knee touches the finger, and can be hooked down by it. It very frequently happens, when the membranes are perfect, that, as soon as the shoulder is felt, the breech and foot come to the os in a moment, in consequence of the tendency of the uterus to bring the long axis of the child coincident with that of its own. Should it, therefore, be difficult to hook down the knee, depress the breech still more, and it will be almost always the case that the foot will be at hand.

"It will, sometimes, render turning more easy if, as soon as the head is above the brim, we pass the outside hand beneath it, and push it up from the outside alternately with the depression of the breech. All this can generally be performed in much less time than I have taken to describe it, although in some it requires gentle, firm, and steady perseverance, with such a supply of patience as is always demanded in obstetric operations. If the os will only admit one finger, and the foot cannot be brought through in consequence, it can yet be retained at the os by pressing it with that finger against the inner surface of the os; the most convenient part being against the anterior part; because the pubes will assist in supporting the pressure, while, at the same time, in most persons, unless very stout, the hand pressing externally above the pubes is capable of assisting materially in retaining the leg in that position, and securing the altered change, ready for us to take advantage of it, should the case so require, as soon as the os dilates sufficiently; and the mere retention of the leg here is of considerable value, for, in cases of turning, even when we cannot effect turning immediately after having seized one of the limbs, yet the holding on to that part, and thereby fixing it, ultimately produces such an improved relationship between the uterus and its contents that the after operations succeed more easily. Should the child face towards the left side, the only difference required in operating is, that the breech be pressed toward the left side, and the head to the right."

Fig. 119.

Second Stage.

Fig. 120.

Third Stage.

Further on, in regard to cephalic version, Dr. Hicks continues: "We will suppose, first of all, a case where the uterus is not active, the liquor amnii not escaped, or only recently so, where the fœtal

head has not passed the os. Introduce the left hand into the vagina as in podalic version; place the right hand on the outside of the abdomen in order to make out the position of the fœtus, and the direction of the head and feet. Should the shoulder, for instance, present, then push it with one or two fingers through the cervix in the direction of the feet. At the same time, pressure by the outer hand should be exerted on the cephalic end of the child. This will bring down the head close to the os; then let the head be received upon the tips of the inside fingers. The head will play like a ball between the two hands; it will be under their command, and can be placed in almost any part at will. Let the head, then, be placed over the os, taking care to rectify any tendency to face presentation. It is as well, if the breech will not rise to the fundus readily after the head is fairly in the os, to withdraw the hand from the vagina, and with it press up the breech from the exterior. The hand which is retaining gently the head from the outside should continue there for some little time, till the pains have insured the retention of the child in its new position by the adaptation of the uterine walls to its form."*

We shall make no apology to the reader for the length of this extract, and the prominence which we have thus given to the operation of bi-polar version, as we look upon it as one of the most important improvements in modern obstetrics, which is attracting an amount of attention ever on the increase, and which is, if we mistake not, likely, ere long, to take the place of the more familiar procedure of ordinary podalic version.

The postural method, to which reference has already been made, has been suggested by Dr. Edwin R. Maxson, of Syracuse, N. Y., as applicable to cases of transverse presentation;* and, although we at once recognize an objection to this procedure in the impossibility of safe anæsthesia, it must at the same time be admitted that the suggestion is an important one, and the cases which Dr. Maxson quotes in support of his theory are both significant and striking. He assumes that the proper treatment in all ordinary transverse cases is to "push back the shoulders or get the head," and this, he assures us, is in most cases readily effected by placing the patient in the genu-pectoral position, when the shoulder can be readily displaced, and the head brought down by the same hand. This, we apprehend, is a method of treatment which, either alone or in conjunction with the bi-polar manipulation, may possibly prove to be a valuable addition to the means at our disposal in effecting the operation of turning in any of its varieties.

CHAPTER XX.

EMBRYOTOMY.

Embryotomy is, in one sense, the most objectionable of all the operations of midwifery; for, of all other possible modes of procedure, this is the one which most certainly involves destruction of the child. On this account, the accoucheur shrinks, with natural repugnance, from an operation which necessarily implies mutilation of a dead, and must destroy a living, child. Such, however, is a view which we are apt to carry to an extreme, and overlook, in so doing, the more important interests of the mother; while we forget that circumstances do arise, when in full knowledge of the fact that the fœtus lives, it may be the duty of the accoucheur unhesitatingly to sacrifice the child, as this is the only means by which he may reasonably expect to save the mother.

Our first and earnest desire, of course, is to save, if it be possible, the child as well as the mother; but, if it should become obvious that all hope of a result so favorable must be abandoned, we may be sure that we are fully justified in giving up the child, if we recognize in this the only mode of preserving the more important life. Nothing, of course, will justify this, short of an absolute conviction that the vectis, the forceps, and turning, are of no avail; for then, and then only, are we justified in laying aside the implements of conservative midwifery, and taking into our hands agents which are destructive to the child. On the Continent generally, and especially in Roman Catholic countries, where the religious element comes more prominently into play, fœtal life is, it must be confessed, more jealously guarded than with us. But, while we fully recognize the humane impulses which may thus sway a purely scientific decision, it must be affirmed that, whenever it is certain that a living child cannot pass, nothing can be more irrational than to await death of the child, before we act upon the conviction that it cannot live,—and thus allow the period to pass at which we may confidently operate in the expectation of preserving maternal at the sacrifice of fœtal existence.

However lightly, on the other hand, we may view these considerations, evidence of the death of the child will always be held as of paramount importance, in all cases in which the operation of Embryotomy may offer itself for our consideration. When this is clear, all scruples will vanish, as we have the mother alone to consider; and, therefore, when the other modes of procedure are impracticable, we will proceed without hesitation to the performance of an operation which treats the dead fœtus as a mass of inert matter, to be removed at the least possible risk to the mother.

The conditions, then, which may be held as warranting the operation of embryotomy are those in which the forceps and turning are of no avail, and which, at the same time, preclude the passage of a living child. In so far as the contraction of the conjugate diameter at the brim is concerned, we have already seen that, in the case of a fully-developed child, we can scarcely expect a successful result from turning, when that diameter is much less than *three inches;* and this, therefore, we may take as the limit within which the operation may be demanded. Tumors of any kind,—bony, malignant, or ovarian; atresia of any portion of the ordinarily distensible canal; impaction of the head, or extreme contraction of the uterus, are illustrations of other causes which, independently of ordinary pelvic distortion, may render delivery by embryotomy the only method from which we can anticipate a favorable result. Although the history of former labors is, in such cases, to be admitted as an important consideration, in determining our course of procedure, the conclusions of many independent observers show very clearly that this must not be allowed to take too prominent a position, as it not unfrequently happens that women who have had an ordinary labor before, under circumstances which are apparently similar, are, if not relieved, subjected in subsequent labors to the greatest peril. This may be due, according to Barnes, to progressive pelvic contraction, or, as D'Outrepont holds, to progressive increase in the size of the children. But, on the other hand, we may fall into the opposite error, if Dr. Matthews Duncan's deductions are correct—that after women have attained the age of twenty-nine, the weight of their children falls,—by supposing, thas because craniotomy was found necessary on a former occasion, it must necessarily be required in subsequent pregnancies which have been allowed to go to the full time. Among the rarer

*On Combined External and Internal Version: by J. Braxton Hicks, M. D., F. R. S., etc. London, 1864.

*See "American Practitioner." March, 1877.

conditions demanding craniotomy, are impacted mento-posterior positions of the face, cases of locked twins, in which one head can only be released by perforating and reducing the bulk of the other, double-headed monsters, and hydrocephalus.

There are, however, in addition to these, certain conditions of the mother which may call for the operation. It has already been shown that, in cases in which, from any cause, speedy delivery is required, turning is to be preferred to the forceps, when the dilatation of the os is not sufficient to admit of the safe use of that instrument: and to this it may now be added, that an even less degree of dilatation of the os will suffice for craniotomy than for turning, as all that is essential is space for the introduction of two fingers and the extremity of the perforator. In certain cases of convulsions, when there is great exhaustion, and in some instances of rupture of the uterus, as already particularized, in which the state of the os forbids both the forceps and turning, it may be necessary for us to perforate. As a rule, however, and excepting the cases of rupture of the uterus alluded to, we should never operate by craniotomy while there is a possibility of nature prevailing, until we have given her a fair chance, and have waited to see what may be effected by the ordinary process of moulding.

The condition of the parts, or the stage of labor at which the operation should be performed, is a matter of great importance, less perhaps in regard to the mere facility with which it may be effected than with reference to the safety of the woman. Although, as has been observed, a very moderate dilatation of the os is all that is essential, it affords great comparative facility to the operator, and proportionate safety to the mother, the further the process of dilatation has advanced. It is of even greater importance that the head should have descended, to some extent, into the pelvis, and be within easy reach; for the operation upon a head which is still above the brim will be found, even under circumstances which are in other respects favorable, to be a very different operation from that in which it is arrested within the cavity of the pelvis. There are conditions, however, which may render embryotomy manifestly impracticable, or which may admit of doubt; so that the peculiarities of individual cases must be our guide as to whether anything is to be gained by delay, and, if so, to what extent we are to maintain an expectant attitude. It is certain that we have less choice here as to the period which we may select for the operation than obtains in regard to some of the other modes of procedure which we have described.

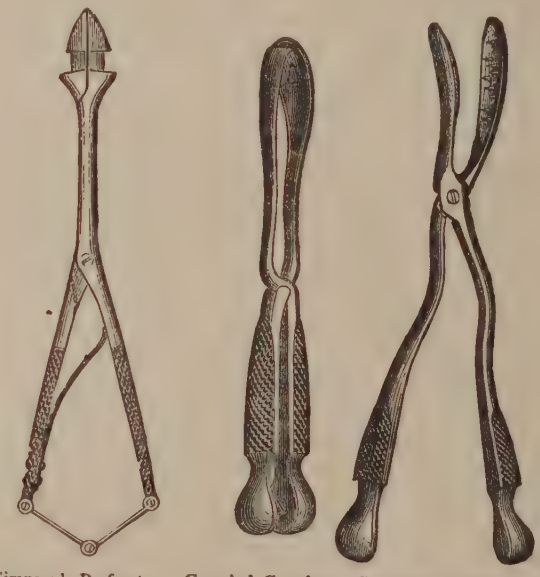
The Operation.—Embryotomy almost always involves craniotomy, so that the two terms are often used as synonyms. Craniotomy has been often euphemistically described as "lessening the bulk of the head." It consists of several stages, some of which may alone be required; or it may be necessary, before effecting delivery, to go through the whole of them, one after the other. We purpose, therefore, to explain these successive steps, as points in detail of one method of operative procedure, according to the degree of pelvic distortion, or other circumstances which may constitute the special impediment—and including the use of the cephalotribe.

The first step in all operations of craniotomy is Perforation, and for this various instruments have been devised, which are termed perforators. The condition of the head, upon which its impaction or resistance depends, is, in the first place, to be overcome, in order to permit of its collapse; and it is with this object solely that we perforate, and so act otherwise as to admit of the escape of the contents of the cranium, so that the forces, natural or artificial, may be brought to bear upon a part which is now susceptible of a considerable diminution in its diameters. The form of instrument which has by many Continental practitioners been preferred, is one which, in the principle of its construction, is almost identical with the ordinary trephine; but what is preferred and invariably used by English operators, is some modification of the perforating scissors of Smellie. The instrument here shown (Fig. 121) is that which was used by Simpson, and which generally bears his name. It consists of two blades with shoulder-stops, the blades, when in apposition, forming a triangle of which the base is at the stops, with cutting edges, converging to a point which is the apex of the triangle. The instrument is thus one which is to be used with the greatest possible caution, lest injury should be inflicted upon the soft parts of the mother. When the blades are separated by pressing the handles together, a powerful spring between the latter causes them to close so soon as the grasp is relaxed.

Its mode of application is as follows: The ordinary preliminaries to the other operations of midwifery having been carefully observed, the woman is to be placed, as usual, upon her left side. Two fingers of the left hand are then introduced into the vagina, and brought to bear upon the most depending portion of the vault of the cranium. With the greatest possible caution, the blades are then to be passed along the palmar aspect of these fingers, which serve as a guard to the maternal parts, until it reaches the surface of the cranium, through which it is thrust by a combined pushing and boring movement as far as the stops. While this is being effected, particular attention should be given, so that the force be applied at right angles to the surface against which it impinges, otherwise the point is apt to glance off, and may seriously wound the mother.

Some have advised that perforation should be effected at the sutures or fontanelles; but, although this renders the operation somewhat easier, the disadvantage is that the subsequent collapse of the head, by overlapping of the flat bones of which its vault is

Fig. 121. Fig. 122. Fig. 123.



Simpson's Perforator. Guarded Crotchet. Craniotomy Forceps.

composed, will necessarily obliterate the aperture, and impede the escape of the cerebral tissue. It is, therefore, much better that we should perforate the parietal bone which presents; and, when this has been done in the manner described, the handles are pressed together and the blades separated. This, by tearing asunder the parts, makes a lacerated and irregular gap in the cranial walls; but, in order to render the aperture more patent, and thus facilitate the escape of the contents, the handles are turned so as to bring the blades half round, and another similar incision is made at right angles to the first. The perforator is then to be thrust into the cavity of the cranium, and freely moved about in all directions so as to break up, as far as possible, cerebrum, cerebellum, and membranes; and if the child is alive, it will be proper to pass it in the direction of the medulla oblongata, so as to cause its death, as cases have occurred in which, after perforation and escape of a portion of the cerebrum, the child has been born alive. The perforator is then to be removed with the same precaution as was observed on its introduction. If the breaking up of the brain has not been satisfactorily accomplished, this may be completed by the crotchet, which, indeed, some operators prefer altogether for this purpose,

withdrawing the perforator so soon as the breach in the cranial walls has been effected.

Complete disorganization of the textures within the cranium does not necessarily imply their immediate expulsion, which can alone insure collapse of the cranial vault. This, no doubt, has already been in a great measure effected by the nature of the aperture which we have made in the parietal bone; but, unless uterine action is present, and can act efficiently upon the cranium, the amount discharged, even through a considerable gap, may be but trifling. In order, therefore, to encourage compression, and the consequent diminution of the cranial diameters, it has been suggested that we should extract the brain substance; and this may be effected without danger, and with more or less of success—which will be proportionate to the thoroughness with which the cerebral disintegration has been effected—by a scoop or spoon, or by the injection within the cranium of a powerful stream of water. So soon as a large portion of the cerebral contents has been permitted to escape, the bones of the skull will collapse under the influence of very trifling compression. This, however, may completely fail, whence arises the necessity of proceeding to another stage of the operation.

If nature, after complete decerebration, fails to effect some advance of the head, it will then be proper to attempt delivery by traction exercised upon any part of it where a secure hold may be maintained. The ordinary crotchet, described in a former chapter, is the instrument which was almost exclusively employed in ancient times, and even in the present day is frequently resorted to. The idea here is to fix the crotchet upon any part of the bones, and, if possible, at the foramen magnum, or the Sella Turcica, where the best and most effective grip may be had, with the least risk of slipping. The directions which are very generally given by the older writers for the employment of the crotchet after perforation, for the purpose of traction, seem to point to fixing it upon some part of the inner surface of the parietal bone, and, having thus secured a good hold, to drag steadily downwards. The great objection to the use of the crotchet in this way is that it is always unsafe, and, in the hands of the inexperienced, eminently dangerous. No one uses the crotchet for this purpose, unless he has previously passed up the finger of one hand in order to protect the soft parts from the possible effects of a sudden and unexpected detachment of the instrument, which, under other circumstances, would probably inflict upon the mother severe, and possibly dangerous, laceration. As it is often difficult efficiently to protect the parts by means of the finger, an instrument called the "guarded crotchet" has been devised. It is variously constructed, but consists essentially of two blades, or rather of a crotchet and a protecting blade. In that which is here shown, the crotchet has three sharp teeth, and is furnished with the ordinary forceps joint, by which it is articulated with the protecting blade. The crotchet, being introduced within the cranium, is fixed in the ordinary manner, and the guard being then passed in the usual way outside of the scalp, the instrument is locked, which, so long as this relative position is maintained, prevents all possibility of laceration by the sharp part of the instrument.

The danger to the mother is, however, in point of fact, less from the crotchet itself, than from the fracture and sudden displacement of the bones to which it is attached. Should the tractile force be trifling, the hold which the crotchet gives us may be maintained; but if, as is more generally the case, we are obliged to use a considerable degree of force, it is very apt to slip from its attachment, or become disengaged in consequence of fracture of the bone. It is on this account that the guard of the crotchet cannot alone be trusted to, and we must therefore pass up the finger, which should be retained in apposition with the head so long as our efforts may last, so that we may at once perceive the earliest indication of slipping, and adopt such precautions as may be necessary for the protection of maternal structures.

The Craniotomy Forceps (Fig. 123) is, as now constructed, an instrument which is greatly superior to the crotchet either single or guarded, and is applicable to almost all cases in which the latter has been employed. When perforation, with evacuation of the cerebral contents, has been completed, and it is found necessary to proceed to the further stages of the operation, the blades of the craniotomy forceps are to be applied, one within and the other without the cranium, that which is convex on the outside being for application over the scalp. It will be observed that one blade is fitted with sharp teeth corresponding to pits or depressions upon the opposed surface of the other.

When suitably adjusted, therefore, all that the operator has to do is to press the handles together with some force, which will insure a grasp upon the wall of the cranium, over a more extended area, as well as more firmly, than can, under any circumstances, be effected by the crotchet. The handles being firmly bound, screwed, or pressed together, as the case may be, traction must now be practised in the direction which may be proper to the actual position of the head. If the bone gives way, the detached portions must be cautiously removed, and a fresh hold obtained wherever the parts may seem most likely to bear the strain; but, when the resistance is great, it will soon become evident that this method of extraction will fail, and we must therefore pass to a more advanced stage still of the operation of craniotomy.

The process which, under such circumstances, is rendered necessary, is the deliberate removal in detail of the flat bones, which require, for this purpose, to be broken up into pieces of convenient size, in order that the whole vault of the cranium may be thus removed, including, in extreme cases, the occiput and the forehead. No part of the operation requires more caution than the removal of the fractured portions of the bones, which are often jagged and splintered, and always sharp at the edges, so much so, sometimes, as to cut through the cuticle of the fingers of the operator, which may afterwards be observed to be scarred as if by the edge of a sharp knife. When our object is to remove the whole cranial vault, the bones are, in the first place, to be broken and separated from their attachments within the scalp—a part of the operation which is best effected by means of the craniotomy forceps. In this case, however, we introduce the blades somewhat differently, passing the outer blade between the scalp and the bone, so that the latter is directly grasped. A smart wrench by the wrist is generally all that is necessary to fracture the bone, when the severed portion which remains between the blades may be removed by the aid of the instrument. Much will, however, depend upon the shape of the fragment, which is to be carefully ascertained by the finger acting in concert with the forceps. If it is very irregular in shape, it will, of course, be all the more difficult to protect the soft parts of the mother from so many cutting surfaces, and it may be necessary to divide it again before attempting extraction. The mode of grasping the fragment must also be attended to, so as to bring elongated portions lengthwise, and in many similar ways we may reduce risk by careful manipulation. Dr. Davis was so impressed with the danger which attends the removal of the fractured cranial bones that he devised an instrument, or rather a series of instruments, which he termed Osteotomists, by which the bones could be more safely removed. One of them is here shown (Fig. 124). It is of the nature of a powerful punch, by which successive minute portions of the bones may be nipped off and removed in the grasp of the blades, thus completely protecting the soft parts. Such an operation was necessarily a very tedious one, and this is probably the reason why the instrument was never much employed,

Fig. 124.

Osteotomist.

and has latterly fallen into complete disuse. We have, however, found it to be extremely useful in cutting any spicula or sharp angular projections which may seem to threaten laceration, and for this reason we look upon it as a most useful aid to have at hand when we have to perform the operation of craniotomy. By dexterous management, however, we may generally succeed in safely removing much larger pieces of bone by the fingers than can be effected by the osteotomist.

In removing the vault of the cranium, it is proper to preserve the scalp. The object of this is to protect the maternal parts from injury. It may happen, after a certain amount of progress has been made, and a considerable portion of the vault removed, that the head collapses to such an extent that the difficulty is got over, and extraction becomes easy. In such a case, the scalp is used as a covering for the bones which remain, and as a protection from spicula and sharp edges, which might otherwise do mischief.

If, at any time in the process of removing the bones, or even earlier, we are able to seize the forehead by the craniotomy forceps and pull it down, this should always be done; but the difficulty in extreme contraction is that the vault of the cranium is not yet sufficiently compressible. It is mainly, therefore, with the object of ultimately bringing down the forehead, which usually lies to the right side, that we thus pick away the bones until there remains, when the process is complete, nothing but the scalp and the base of the skull.

There is another method of procedure, not often resorted to, but which, in some instances, is of undoubted efficiency after perforation. This is the ordinary operation of turning, which may sometimes be effected without much difficulty when, by the perforator, we have reduced the bulk of the child's head. To attempt this in cases of very great distortion would, on many grounds, be improper; but in more moderate disproportion, it is sometimes an efficient and valuable method of completing delivery. A striking instance of this kind, which we saw with Drs. Lyon and Dick, was that of a woman in whom it had been found necessary to perforate in consequence of very considerable conjugate contraction. Traction with the craniotomy forceps was found to be insufficient, and failed to dislodge the head of the child. A considerable portion of the bones was then removed, but, before entirely removing them, and proceeding to the more advanced stages of the operation, to be described immediately, an attempt was made to turn, when, the foot being brought within reach, this was effected without the slightest difficulty. In all such cases, it is of the first importance that the scalp should cover the fractured bones, and we should, therefore, be particularly careful that this should be insured before we attempt to turn.

The flat bones being removed, the next question for consideration which presents itself is one which, without a thorough knowledge of the fœtal and maternal parts, could not fail to give rise to much doubt and apprehension. What remains behind of the head consists entirely of the base of the cranium, a part which, even at this early age, is very solid and unyielding, in order to afford protection to the vital structures which might otherwise be subjected to dangerous or fatal pressure. The shape of the base of the skull is that of an irregular ovoid disk, the long diameters of which are across the pelvis. It would seem, therefore, at first, as if no great advantage had been gained by the removal of the flat bones; but a moment's consideration will show that a very simple manœuvre, and one which is generally easy of performance, will suffice to place what remains of the head much more favorably. "I have carefully," says Dr. Burns, "measured these parts, placed in different ways, and entirely agree with Dr. Hull, a practitioner of great judgment and ability, that the smallest diameter offered is that which extends from the root of the nose to the chin; for, in my experiments,—after the frontal bones were completely removed, and the lower jaw pressed back, or its symphysis divided so as to let its sides be pushed away,—this did not, in general, exceed an inch and a half. It is, therefore, of great advantage to convert the case into a face presentation." The practice thus recommended by Burns was at an earlier date upheld by Dr. Osborn, who was the first clearly to show that, by *canting* the base of the skull, so as to bring it edgewise into the brim, it was perfectly possible to deliver a full-sized child through a conjugate diameter measuring an inch and a half only. A very remarkable case, that of Elizabeth Sherwood, which is specially interesting as bearing upon the question which we are now considering, may here be detailed in a very abridged form. The circumstances of this must, however, have been peculiar, or, possibly, the observation of the conjugate measurement was inaccurate.

The patient was so deformed, both in her spine and her lower extremities, "as never to be able to stand erect for one minute without the assistance of a crutch under each arm." At the age of twenty-seven she became with child, and was admitted a patient into Store Street Hospital, where she was seen by W. Hunter, Denman, and other eminent obstetricians of the day, who gave their sanction to the course of procedure, which Osborn ultimately adopted with such remarkable success. Dr. Osborn describes his first examination as follows: "Immediately upon the introduction of the finger, I perceived a tumor, equal in size, and not very unlike in feel, to a child's head. However, it was instantly discovered that this tumor was formed by the basis of the sacrum, and last lumbar vertebra, which, projecting into the cavity at the brim, barely left room for one finger to pass between it and the symphysis pubis, so that the space from bone to bone at that part *could not exceed three-quarters of an inch.*" The operation which was determined upon (a decision which gave rise afterwards to no little discussion) was to effect extraction by the perforator and crotchet. "Even the first part of the operation, which is in general sufficiently easy, was attended with considerable difficulty, and some danger. The os uteri was but little dilated, and was awkwardly situated in the centre and most contracted part of the brim of the pelvis. The child's head lay loose above the brim, and scarcely within reach of the finger, nor was there any suture directly opposite to the os uteri." The operation of perforation and decerebration was effected without any unusual difficulty, and the patient was then left, as was the general practice in these days, for six and thirty hours, in order to allow the uterus opportunity to force the cranium downwards as far as possible within the reach of the crotchet, a result which was counted upon to some extent, as the effect of putrefactive change.

"I determined," he continues, "to begin to make an attempt to extract the child. *I call it an attempt, for I was far from being satisfied in my own mind of the practicability.* My first endeavors were bent to draw the os uteri with my finger into the widest part of the brim of the pelvis, and to dilate it as much as possible. But the removal of the os uteri, and such dilatation of it as the bones admitted, were effected without much trouble. I then introduced the crotchet through the perforation into the head, and, by repeated efforts, made in the slowest and most cautious manner, destroyed almost the whole of the parietal and frontal bones, or the whole upper presenting part of the head; and as the bones became loose and detached, they were extracted with a pair of strong forceps, to prevent, as much as possible, laceration of the vagina in their passage through it. The great bulk of the head, formed by the base of the skull, still, however, remained above the brim of the pelvis; and from the manner in which it lay, it was impossible to enter without either diminishing the volume, or changing the position; the former was the most obvious method, for it was a continuation of the same process, and, I trusted, would be equally easy in execution. I was, however, grievously mistaken and disappointed, being repeatedly foiled in every endeavor to break the solid bones which form the basis of the cranium, the instrument at first invariably slipping as often and as soon as it was fixed, or, at least, before I could exert sufficient force to break the bone. At last, however, by changing the position of the instrument, and applying the convex side to the pubis, I fixed the point, I believe, into the great foramen, and by that means became master of the most powerful purchase that the nature of the case admitted.

"Of this I availed myself to the utmost extent; slowly, gradu-

ally, but steadily increasing my force till it arrived at that degree of violence which nothing could justify but the extreme necessity of the case and the absolute inability, in repeated trials, of succeeding by gentler means. But even this force was to no purpose, for I could not perceive that I had made any impression on that solid bone, or that it had been in the least advanced by all my exertions. I became fearful of renewing the same force in the same way, and, therefore, abandoned altogether the first idea of breaking the basis of the cranium, and determined to try the second by endeavoring to change the position. I, therefore, again introduced the crotchet in the same manner, and fixing it in the great foramen, got possession of my former purchase; then, introducing two fingers of the left hand, I endeavored with them to raise one side of the fore part of the head, and turn it a little edgeways. Immediately and easily succeeding in this attempt, the two great objects were at once accomplished; for the position was changed and the volume diminished. Continuing my exertions with the crotchet, I soon perceived the head advance, and, examining again, found a considerable portion of it had been brought into the pelvis. Every difficulty was now removed, and, by a perseverance in the same means for a short time, the remaining part of the head was brought down and out of the os externum."

We cannot wonder that the result in this case, and the satisfactory recovery of the mother, should have been looked upon as a great triumph of the crotchet as compared with the otherwise inevitable expedient of the Cæsarean Section. Of late years this question has been more thoroughly investigated and illustrated. Dr. Braxton Hicks, in a learned and elaborate paper,* describes very fully the mechanism of the proceeding. What he recommends is to grapple the orbit and draw it downwards by means of a small blunt hook. "The one which I use," he says, "is of the following size: the diameter of the iron rod from which it is made is about a quarter of an inch, of the length of the ordinary blunt hook; with handle also alike. The hook is a half circle about one inch in diameter, and is made hard, to prevent its opening during traction; the shaft is made of soft iron, and can be bent by the hand into any form, being thus adaptable to any situation. I may mention here that this hook is useful, in other cases, in a variety of ways, where it is impossible to employ the unwieldy blunt hook in general use."

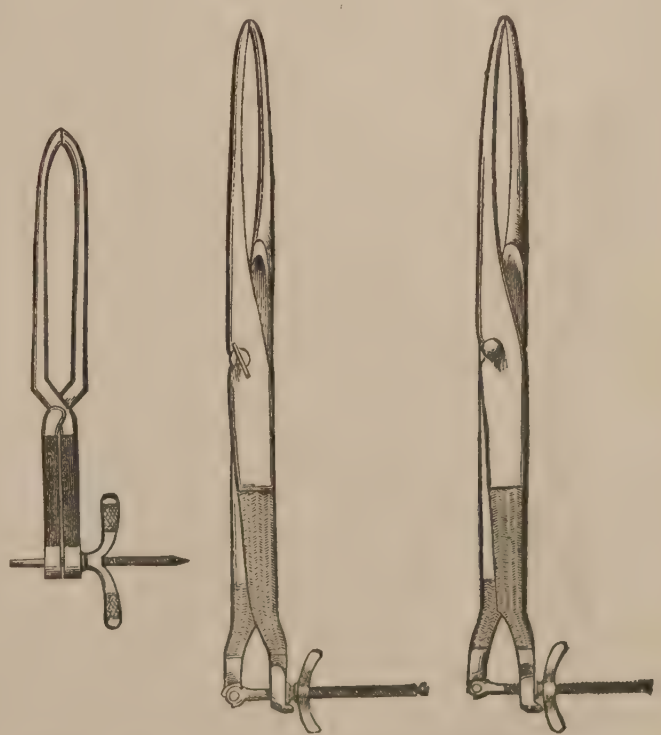
Dr. Barnes, after removing the arch of the calvarium, or the whole of the bones if the distortion be extreme, prefers, for effecting the same object, the craniotomy forceps. The instrument which he uses is of considerable strength, and is provided, like Braun's, with a screw at the ends of the handles, which secures for it the ordinary advantages of the cephalotribe, by crushing in the frontal bones, and has the further advantage of securing an unyielding hold. "Then traction is made, carefully backwards at first, in the course of the circle round the false promontory. As the face descends it tends to turn chin forwards, and this turn may be promoted by turning the handles of the instrument. It is not necessary that the turn should take place, for the case differs entirely from that of the normal head. There is no occiput to roll back upon the spine between the shoulders. The head comes through flatwise like a disk by its edge."

The above extracts, which represent the most modern and scientific modes of practice, will suffice to prove that where the pelvis measures *two inches*, or even somewhat less, in the conjugate diameter, a fully developed child may yet possibly be extracted. It is obvious, however—the transverse diameter of the face being more considerable—that, to insure success, there must be a larger space, certainly not less than three inches in the transverse diameter. "I go further," says Barnes, in reference to this operation, "and declare that it is perfectly unjustifiable to neglect this proceeding, and to cast the woman's life upon the slender chance afforded by the Cæsarean Section."

The Cephalotribe.—If the facts and arguments above cited are strictly correct, the number of cases in which the cephalotribe is called for are probably very limited in number. They are certainly much more so than was at one time supposed. The earliest instrument designed for crushing the bones of the fœtal skull seems to have been the Compressor Forceps of Assalini, which was used by him to crush the base of the skull and the face, early in the present century. The blades of this instrumen twere not made to cross, so that when they were screwed together, the fulcrum of each lever was—as in his forceps—the joint at the end of the handles, where they were articulated. The only modern instrument resembling this in principle is the cephalotribe of Lazarewitch of Charkoff. What, with certain modifications, is known as the French cephalotribe, was invented by the younger Baudelocque. It is, in appearance, a most formidable instrument; the one in our possession weighing no less than 4 lbs. 6½ oz., and measuring across the blades nearly two inches, in the widest part. It requires, therefore, no argument to show that such an apparatus is not applicable to a case like that of Elizabeth Sherwood. Various modifications have, in modern times, been designed by Scanzoni, Braun, Simpson, and others, almost all of which are constructed with a moderate degree of pelvic curve. They are all made lighter than the original instrument, as it has been found that clumsiness may be, to some extent, avoided without any material sacrifice of strength. The tendency of the English instruments is to approach more in form to the ordinary midwifery forceps, as is well shown in Simpson's cephalotribe, which is here represented (Fig. 125).

As in the case of the forceps, there has existed in this country some controversy as to whether the pelvic curve should or should not be adapted to the cephalotribe, those who approve of the straight instrument arguing with some force that the straight blades are easier of application, and can alone be properly applied when we wish to rotate. The fact that the head is at the brim seems to us, on the contrary, to vindicate, on the same grounds which have been urged with reference to the long forceps, that unless we are, as Pajot and some others advise, absolutely to discard the instrument as an extractor, we must admit that the principle of the pelvic curve ought to be conceded here also. The objections which Dr. Kidd and others have urged against the pelvic curve have, however, so

Fig. 125. Fig. 126. Fig. 127.



Simpson's Cephalotribe. French Cephalotribe. Dr. Matthews Duncan's Cephalotribe.

* Obstetrical Transactions, vol. vi. 1865, p. 263.

far prevailed, that the English instruments are all, without exception, made with a slighter curve than the French ones.

The French cephalotribes (Fig. 126), still retain, as we have said (and, we may add also, the German modifications of Braun and Scanzoni), much of the original formidable dimensions of the instrument. We might have contented ourselves with the mere mention of this fact were it not that of late years some able obstetricians have condemned the English instrument, and insisted that we should do better to adhere more closely to French models in the construction of cephalotribes. Dr. Matthews Duncan, assisted by Professor Inglis, of Aberdeen, and others, made some very interesting experiments with a view of comparing the effects of Simpson's cephalotribe and the more modern of the French instruments. The experiments were performed on fœtal crania, and on the skulls of dogs, and certainly served very clearly to demonstrate that the French cephalotribes have greater power. Are we, therefore, on that account, to prefer them, to the exclusion of those with shorter handles?

In reply to this question, Dr. Duncan expresses a decided preference for the French cephalotribe, a modification of which he has devised, so as to combine the lesser degree of pelvic curve which is characteristic of English instruments, with certain other modifications which he considers as offering some advantage. Dr. Duncan's cephalotribe is here represented. Drs. Barnes and Braxton Hicks are, again, warm supporters of what we have termed the English cephalotribe, and while they do not assert that the crushing force is equal to that of the French instrument, they maintain that the power is attained in sufficient perfection for the object which we have in view, and that there is a gain in the facility of handling, which may be held as sufficient to counterbalance any trifling loss of power.

[Finding that the cephalotribe that we used slipped off the crushed head when used as a tractor, we devised the instrument here shown (see Fig. 128), and have used it for the past ten years with satisfaction. During the operation of crushing, the child's head is impressed within the fenestra in the blades of the cephalotribe and is thus prevented from slipping. While the pelvic curve has been retained it is much less than that of the Hodge forceps.—G.]

Fig. 128.

Dr. Getchell's Cephalotribe.

We have at present to consider the subject of Cephalotripsy as the final stage of the operation of craniotomy in cases of great pelvic contraction. Perforation, decerebration, removal of the flat bones, and canting edgewise of the base of the skull have all, we shall suppose, been successively tried, but to no purpose. Can anything further, we ask ourselves, be done in this same direction?—a question which finds its reply in the operation which we are now considering. The object of the instrument is, as its name implies, to *crush* the unyielding base into a pulp, and thus bring it through the contracted diameters. The blades are introduced in the same manner as those of the ordinary long forceps, in the direction in which there is least resistance, which will generally be the sides of the pelvis. They are passed high up, so as to reach quite beyond the base, which it is our object to crush; and, being adjusted, the screw is then turned steadily and cautiously, while the finger within the vagina takes note of what is being done, and is ready to remove at once any spicula of bone which may crop up under the influence of the crushing force. Whatever form of instrument we may choose, it should be one which does not measure, when closed, more than an inch and a half outside the widest part of the blades. This admits, therefore, of such crushing as may enable the head to pass through a diameter which may be contracted to that extent. If the deformity is great, a second crushing may be necessary, and, for this purpose, the blades should be removed and re-introduced, so as to secure a grasp which should be, as nearly as possible, at right angles to the first.

It must not be supposed that it is only to cases in which the whole of the flat bones have been already removed that the operation of cephalotripsy is applicable. On the contrary, it may often be used with advantage when only a portion of the vault has been got away. This is generally sufficient to admit of the easy introduction of the blades, so that, if unusual difficulty is experienced in extracting the bones, and the head refuses to advance under steady traction, the operation will have the double effect of crushing the base and permitting the collapse of the skull, and complete escape of all its contents. In this case, however, we should watch with special caution the effect of the compression upon the cranium, otherwise the maternal parts may, at any moment, be wounded by fragments of the tabular bones.

A subject which has given rise to no little discussion, is whether or not we should, after crushing, use the cephalotribe as a tractor. Pajot condemns such a course, and recommends a procedure which he describes as "*cephalotripsie répétée sans tractions*," in which he leaves expulsion absolutely to nature. He also recommends, what, if feasible, is certainly advantageous—that we should rotate the head which has been operated upon, so as to bring its crushed diameter in relation with the contracted diameter of the pelvis. This condemnation of the cephalotribe as a tractor, seems chiefly to be supported by those who, in France or elsewhere, uphold the use of the bulky instruments which are very obviously less suitable for such a purpose. What seems, therefore, to be the chief advantage of the lighter English instrument, is that traction may by it be more safely performed. Indeed, it appears to us in the highest degree irrational that we should forego all the advantages of traction which spring from such a firm grasp of the head as the cephalotribe gives. We cannot, indeed, be too cautious in our manipulations; but, we can see no reason why, after efficient crushing, we should not pull gently with the handles backwards, which we can, of course, do with more safety, and a greater advantage, than if there was no pelvic curve to the blades. Another disadvantage of removing the blades, and leaving the further progress of the case to nature, is said by Dr. Barnes to consist in the resiliency of the fœtal structures; so that a head flattened within the grasp of the cephalotribe so as to measure not more than an inch and a half, may spring out on the removal of the blades to more than two inches.

When the mutilated head at length glides through the chink which has so obstinately barred its progress, the young operator may hastily conclude that his difficulties are necessarily at an end. In cases of minor disproportion, it will no doubt be so; but, in extreme distortion, the descent of the shoulders and trunk may be attended with very considerable difficulty. If the remains of the head be still within the grasp of the cephalotribe, it is proper to continue the tractile force backwards, as far as may be practicable with a due regard to the integrity of the perineal structures. This is done with the view of disengaging the anterior shoulder, or bringing it a little in advance, so that the blunt hook may be fixed in the axilla to pull it through. It may be necessary at this stage, when the blunt hook and crotchet fail to effect delivery, that the cephalotribe should be again used, and the trunk crushed prior to delivery; a proceeding which, although rarely necessary, is certainly preferable to the employment of such violence as might otherwise endanger the tissues of the mother.

There are cases in which it is found necessary to lessen the bulk of the head in breech presentations, or after turning, the head being arrested after the trunk has been successfully disengaged from a contracted pelvis. In this case, the conditions of the operation are inverted, but are not by any means, as a rule, more difficult.

Perforation may be effected behind the ear, and this situation should be selected as the point at which we may most readily attain the cavity of the cranium, and give exit to the brain substance, so as to permit of the collapse of the head. In this case also, the cephalotribe may be employed with great advantage, by crushing the base of the skull, which in this instance is in advance of the vault; and, if the measurements are such as to have already admitted of turning, or of the descent of the breech, we may be almost sure that the collapse of the head which must now necessarily ensue, will amply suffice to permit of its passage through the pelvis.

Embryulcia.—When some part of the child other than the head presents, it may be requisite to use the perforator upon the trunk, and endeavor to extract the child by the evacuation of the contents of the thorax and abdomen. This is one of the methods, for example, which have been practised in cases of transverse presentation in which turning is impracticable. There is no difficulty in such a case in making a breach in the thoracic walls, below the axilla, of sufficient size to admit of the removal of the lungs and heart, and, subsequently, by perforation of the diaphragm, of the abdominal viscera—the most important of these being the liver, which, as is well known, is of great size in the fœtus. The breaking up of the organs prior to their removal cannot be effected in the same bold manner as in craniotomy, as we might easily perforate the trunk, and wound the walls of the uterus. After thus reducing the bulk of the trunk, what should now be attempted is an imitation of the natural processes of spontaneous evolution, or spontaneous expulsion, which may be effected by forcibly dragging down the breech, by the blunt hook or otherwise, after the organs have been removed. This, however, is not always easy; and we have a vivid recollection of such a case, which we saw many years ago, where turning had been found impracticable, and embryulcia had been practised to the extent of removing the whole of the abdominal and thoracic organs. The crotchet and blunt hook were repeatedly fixed upon the pelvis and lower vertebræ, but without success, and the woman ultimately died undelivered. Looking back upon this case with the vividness with which memory recalls early experiences, we feel assured that the treatment proper to it ought to have been decapitation, and not evisceration.

Decapitation has been described in a previous chapter, and should, we believe, be always taken into consideration when the question of embryulcia in impacted transverse presentation crops up. Evisceration is not, however, limited to cases of transverse presentation, but may be found necessary, and has often been practised as a sequel of craniotomy, when it may be requisite to diminish the bulk of the trunk, on precisely the same principle as has guided us to perforation of the cranium at an earlier stage of the operation, where we cannot succeed in delivering by the blunt hook, crotchet, or any other instrument which we may employ purely for the purpose of traction. It is probable, however, that under such circumstances, the process previously detailed, in which the cephalotribe is the agent employed, might be adopted with a better prospect of satisfactory results.

A very powerful instrument, but one rather complicated in its construction, is that which was invented by Van Huevel, of Brussels, and has subsequently been adopted by some eminent Continental practitioners as a substitute for the crotchet, cephalotribe, and other instruments which we have described as essential to the performance of craniotomy, under any circumstances which may involve greater difficulty than usual. This instrument is known as Van Huevel's Forceps Saw, and consists in the first place of forceps, of which the blades are of unusual strength. On the inner aspect of the latter is a groove extending from about one inch below the extremity to near the lock. Within the groove, and protected by a band of steel, the chain saw is introduced after the blades have been adjusted, and is then made to cut from without inwards, or from the lock towards the tips of the blades, until the head has been divided—the chain being worked by two small cross handles at its extremities, while its action, protected by the blades of the forceps, may be looked upon as absolutely safe.

Dr. Barnes has lately suggested another operation, by which the wire écraseur may be used for the purpose of bisecting the head, or otherwise operating upon the body of the fœtus. This method of performing embryotomy was demonstrated by the inventor before the Obstetrical Society, the instrument employed being the écraseur of Braxton Hicks. He recommends the employment, not of the wire rope suggested by Hicks,* but of a single loop of strong steel wire, which he manipulates, so as to pass it through the cervix uteri and the chink of the pelvic brim. The crotchet being passed into the hole made by the perforator, and held by an assistant, so as to steady the head, the loop is guided over the crotchet to the right side of the uterus, where the face lies. "The compression being removed, the loop springs open to form its original ring, which is guided over the anterior part of the head. The screw is then tightened. Instantly the wire is buried in the scalp; and here is manifested a singular advantage of this operation. The whole force of the necessary manœuvres is expended on the fœtus. In the ordinary modes of performing embryotomy, as by the crotchet especially, and in a lesser degree by the craniotomy forceps and cephalotribe, the mother's soft parts are subjected to pressure and contusion. The child's head, imperfectly reduced in bulk, is forcibly dragged down upon the narrow pelvis, the intervening soft parts being liable to be bruised, crushed, and even perforated. And this danger, obviously increasing in proportion to the extent of the pelvic contraction, together with the bulk of the instruments used, deprives the mother, in all cases of extreme contraction, of the benefit of embryotomy, leaving her only the terrible prospect of the Cæsarean Section. When the anterior or posterior segment of the head is seized in the wire loop, a steady working of the screw cuts through the head in a few minutes. The loose segment is then removed by the craniotomy forceps. In minor degrees of contraction, the removal of one segment is enough to enable the rest of the head to be extracted by the craniotomy forceps. But in the class of extreme cases, in which this operation is especially useful, it is desirable still further to reduce the head, by taking off another section. This is best done by re-applying the loop over the occipital end of the head."

A word may here be added as to the probable range of cases within which the cephalotribe may be applied. Much will, of course, depend, as has already been observed, upon the degree of contraction, not only of the conjugate, but of the other diameters of the pelvis. In a discussion on this subject, held at Berlin, the majority of the speakers thought that a minimum of two inches in the conjugate diameter was necessary. Credé, Pajot, Hicks, and Barnes have, however, encountered cases in which the contraction ranged from one and three-quarters to one and a half inches, and have yet been able successfully to accomplish the operation. It is important that facts such as these should be borne in mind when we have to consider the *dernier ressort* of operative midwifery—the Cæsarean Section—which will form the subject of the following chapter.

* We have frequently employed this instrument for the removal of uterine polypi, and in other similar operations, but have found that the wire ropes suggested by the inventor are not to be depended upon, and are apt to snap under a powerful strain. Thinking at first that this was due either to some imperfection of the instrument, or to some fault in the annealing of the wire of which the rope was composed, we consulted Dr. Hicks, who was so obliging as to order a complete instrument and ropes, after his own model; but the result was still far from satisfactory. From the experience we have since had of the single steel wire suggested by Dr. Barnes, we are inclined to give it a decided preference.

CHAPTER XXI.

HYSTEROTOMY AND ALLIED OPERATIONS.

Hysterotomy or, as it is more familiarly known, the Cæsarean Section, is an operation whereby the fœtus is extracted through an opening which is made in the abdominal and uterine walls. The propriety of such a procedure, in the case of the sudden death of the mother, is in the hope of extracting a living child, so obviously a course to which no exception can be taken, that nothing need be urged in justification of the operation in the abstract.

From the earliest period in the history of midwifery, it had been occasionally practised on women dying during labor; and the names of Scipio Africanus, Manilius, Andria Doria, and others, are recorded as having been brought into the world under such circumstances, in obedience to the law of Numa, which forbade the burial of a pregnant woman in whom the operation had not been performed. About the end of the sixteenth or the beginning of the seventeenth century, it would appear that the operation had been performed in cases in which the child had escaped into the cavity of the peritoneum; but as this proceeding is not, properly speaking, the Cæsarean Section, these cases are only to be regarded as instances of Laparotomy or Gastrotomy. It is not precisely known at what epoch Hysterotomy was first performed on the living woman; for there is every reason to believe that the cases published by Rousset in 1581 were to be referred chiefly to the preceding category. The publication of Rousset's work, celebrated in the history of the subject, gave rise to the most extravagant expectations, and at one time the operation was so recklessly performed by surgeons, that it was only by the uncompromising attitude of Guillemeau and Ambroise Paré that it fell into disfavor. It is of this period that Scipio Merunia spoke when he talked, with pardonable exaggeration, of the operation being as common in France as bleeding in Italy. The opposition thus encountered in such influential quarters had well nigh condemned the Cæsarean operation to oblivion; but it was again revived, and gave rise to endless and bitter discussion during the whole of the seventeenth, and, we may add, the first half of the last century, without anything definite having been elicited or determined upon, the profession being divided into two parties, one of which condemned the operation in the most uncompromising way, while the other as warmly, and with even less of discretion, was enthusiastic in its support. It will be observed, therefore, that the Cæsarean Section, as now calmly looked upon in the light of science, dates from quite modern times.

While it must be admitted that every step in advance which has been established by conservative midwifery throws further into the shade the sacrificial or more desperate operative resources of the art, there probably exist no practitioners in the present day who will not admit that there are cases in which hysterotomy is justifiable on grounds which will stand the test of the strictest scientific examination. Putting aside, for the moment, the cases in which it may be practised upon the dead, it may be broadly asserted that the operation is called for on the living in all cases in which the state of parts is such as to preclude the possibility of delivery by embryotomy. In other words, we are driven to this last resource whenever we recognize the fact, that the fœtus, however mutilated, cannot be extracted by the pelvic canal.

Considerable difference of opinion unfortunately exists as to the limit of contraction which will warrant the performance of hysterotomy. In Germany, it is very generally asserted that two and a half inches, in the conjugate of the brim, is to be held as the limit in question; but there are, in so far as we are aware, none in this country who endorse this view. What has already been said in the preceding chapter affords ample proof that craniotomy may be successfully performed in contractions of one inch and three-quarters; and the experience of some of the most distinguished of modern operators seems to show that this limit may be reduced to one inch and a half. We may say, then, confidently, that when the conjugate diameter exceeds these limits, we are in no case justified in at once deciding in favor of the Cæsarean operation. We must once more, however, reiterate a former observation, and call attention to the fact that the conjugate measurement is not alone to be taken into account—as it is too much the fashion to do—seeing that we may have irregular or angular distortion, in which the other diameters are similarly or, it may be, chiefly distorted.

And it is a point of very great interest and importance that, of the whole number of reported cases of hysterotomy, a large majority were due to osteomalacia, in which, as we have seen, the typical distortion does not necessarily involve the conjugate diameter at all. A much smaller number were cases of rickets; and, among the rarer conditions calling for the operation, may be mentioned exostosis, fracture of the pelvis, spondylolysthesis, fibrous or other tumors, and carcinoma of the os and cervix. What we wish, therefore, more particularly to notice is that the conjugate measurement cannot be accepted as *the* test of the necessity which may be assumed to exist for the performance of this operation.

The maternal mortality in this country has been so great—not less than 85 per cent. of all recorded cases—that a very general idea prevails that this is almost exclusively a child's operation. This is a double error; for, when we perform the operation, in a case where we know that the child cannot be otherwise born, we give the mother the chance, small though it be, of recovering from the effects of the operation, while otherwise we must leave her to die; and, as regards the child, the results are far from being so favorable as to warrant us in looking upon it as a child's operation, although it may, no doubt, fairly be inferred that this is attributable in some degree to the fact that the operation is often delayed too long.

If we turn for a moment from British to Continental statistics, it must be admitted that the results are vastly more favorable in the latter case. The reason of this is obvious, and has its origin directly, or indirectly, in the greater regard for fœtal life, which, on religious grounds, causes hysterotomy to be looked upon with more favor than embryotomy. Dubois says, for example, that when the brim is contracted to two inches, and the child is living, we should choose the former operation without hesitation. His authority, therefore, and that of others of equal distinction, has necessarily led to the performance of hysterotomy in a larger proportion of cases than has ever obtained in this country. Moreover, the very anxiety to save the child leads to the performance of the operation at a much earlier period of labor than is practised in this country; and we cannot doubt that it is this which brings about their successful results. It is, indeed, of vital importance that the operation

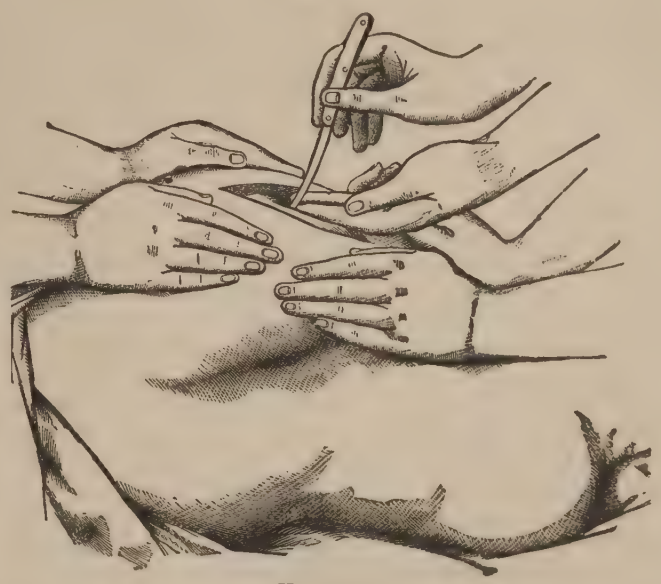
should not be delayed until symptoms of exhaustion have set in, as has been too often the case in England,—although we operate, primarily at least, in the interests of the mother, and with a mere secondary consideration for the life of the child. It is difficult to avoid the conclusion—in which we have the support of Cazeaux—that the operation is rashly undertaken, by many of our Continental brethren, in cases where the proper operation is embryotomy. This is one of many causes which should encourage us to give to the subject of embryotomy our best and most earnest consideration, that we may, by perfecting that operation, reduce more and more the necessity for having recourse to hysterotomy. If we admit the religious element into the question, our difficulties are inevitably increased. Or, should we give force to such considerations as are suggested by Denman—that we should gravely consider, whether, in the case of a woman who, knowing that she cannot bear a living child, has allowed herself to become pregnant, we should not act rather in the interests of the child—or, in other words, if we weigh the life of the child as of equal importance in any case with that of the mother, we will speedily become bewildered in the mazes of casuistry, and may be led to do what is morally wrong. In a word, hysterotomy is no exception to the general rule that we should act *primarily* in the interests of the mother.

When the operation is called for by the death of the mother, either before or during labor, there are no considerations which will encourage a moment's hesitation or delay. During labor, it may be possible to turn and deliver, or to extract by the forceps almost as rapidly as to remove the child through the abdominal walls,—and this proceeding has the advantage of being less repugnant to the feelings of relatives and friends; but, if the os is not sufficiently dilated, or if labor has not commenced, we have no choice in the matter, the only rule being to extract the child without unnecessary delay. The period during which the vitality of the child may be preserved is probably very limited. Authentic cases are recorded in which the child has been removed alive ten, fifteen, and even thirty minutes after the death of the mother; but we must treat as fables those instances of which we read, where it is said to have been found alive ten, fifteen, or twenty-four hours after the mother had ceased to live. In death before the seventh month, it would be a manifest impropriety to operate; but religious convictions have caused this to be done in order that the child may have the benefit of Christian baptism.

The Cæsarean operation is, however, under certain circumstances, imperatively demanded while the mother still lives. Let us see, therefore, what are the conditions upon which success will mainly depend. The first, and perhaps the most important point, is the early recognition of the nature and extent of the obstruction. This will enable us to prepare the woman, in some degree, for the great peril to which she is about to be subjected, by careful attention to the bowels and so forth. It is a matter of doubt, whether we should wait for the coming on of labor, or induce it artificially. There are arguments in favor of both modes of procedure, but perhaps the safest plan will be to wait until nature gives evidence that she is about to call upon the uterus to assume its physiological action, which will be an assistance to the operator at certain stages; and, besides, we are entitled to assume that, at the full time, the healing process is more likely to be encouraged by the normal physiological phenomena of involution. Under no circumstances should we operate until the os has opened to some extent, so as to permit of the discharges passing by the normal channel; but, if it be thought advisable to precipitate matters, this can always be done by some of the ordinary modes of procedure for bringing on premature labor. Winckel says that the most favorable period for the operation is the end of the first stage; and he recommends that we should not rupture the membranes, as some have done, with the view of permitting the escape of the liquor amnii.

The Operation.—The measures to be taken before commencing the operation should be those which the most experienced of our ovariotomists have found, of late years, to be conducive to success. The patient should be placed upon a high bed or table, in a good light, with her shoulders a little elevated. The temperature of the room should, if necessary, be artificially raised. The operation should be performed under the carbolic spray and with the most scrupulous attention to all the details of the antiseptic surgery, precisely as in a case of modern ovariotomy. There should be at hand an abundant supply of hot and cold water, and a sufficiency of towels and sponges. Several bistouries, with sharp and blunt points, artery forceps, ligatures of various kinds (including antiseptic catgut), bandages, carbolized dressings and a long probang, will, with the usual minor instruments of an ordinary pocket-case, be all that is necessary. The propriety of giving anæsthetics in this operation has been called in question, chiefly on account of the disastrous effect which an attack of retching might have at a critical moment of the procedure; but if the stomach is empty before these agents are administered, the risk is not likely to be great. The operator, standing in front of the patient, and having ascertained that the bladder is empty, must first examine the abdominal walls, in order to ascertain, with precision, the position of the uterus with reference to them. A final examination, *per vaginam*, should also

Fig. 129.



Hysterotomy.

be made, as some cases of osteomalacia have been recorded in which the bones of an extremely distorted pelvis have yielded so much as to admit of the passage of the hand. The primary incision is to be made in the middle line, and should extend from a little below the umbilicus to about two and a half inches above the pubic symphysis. Further than this it would be imprudent to go in the latter direction, and, in the case of extreme deformity or unusual shortness of stature rendering a larger incision necessary than can be effected by this rule, the wound should be commenced above, and a little to the left of the umbilicus. The knife should be carried through the skin and subcutaneous cellular tissue, and the various aponeurotic layers successively divided, until the peritoneum is reached. Any bleeding vessels should be carefully secured before going further.

The uterus having been previously adjusted, so as to bring its axis as nearly as may be into parallelism with the abdominal incision, the hands of two assistants are now to be placed above and below, with the view of bringing the uterine and abdominal walls into close apposition, and thus maintaining their relative positions until the operation has been completed. The section of the peritoneum should be effected with caution, not only with the view of protecting the subjacent uterine tissue, but also to avert the possibility of wounding the bowel, as cases have been known in which convolutions of the small intestine were lodged in front of the uterus. When the peritoneal cavity has been opened in this manner, the operator should introduce, through the first minute incision, a director, upon which he

may cut; or having made an aperture sufficient to admit of the passage of the forefinger, that may be advantageously used as a director, along the palmar surface of which a blunt pointed bistoury may be passed. During the whole of this process, the attention of the assistants should be sustained, so as to prevent the possibility of protrusion of the bowels, while any discharge should be assiduously removed by means of sponges wrung out of carbolic solution.

The surface of the uterus being now brought into view, the next stage of the operation consists in the section of its walls. It has been said that the site of the placenta may be determined by auscultation, a bulging of that portion of the uterine wall, and by certain other signs to which it is unnecessary to refer; but we do not believe that any of these signs are such as may be depended upon, so that the exact situation of the placenta must remain, in some degree at least, doubtful. The uterine incision is to be made in the middle line, so as to correspond to that in the abdominal walls, and is to be carried cautiously through the peritoneum and proper tissue of the organ, so as to avoid the fundus and cervix; the reason being that the section of the circular fibres there situated would be extremely likely to cause a gaping of the wound. As the knife approaches the inner surface of the uterus, we must exercise some caution lest we injure the placenta, which may be immediately subjacent; and if it should chance that this structure intervenes between us and the embryo, we must carefully insinuate the fingers between the placenta and the uterine wall, until we reach the margin of the former, before attempting to extract the child.

If—as is usually considered a favorable condition at this stage—the membranes are intact, the escape of the liquor amnii must be guarded against at the moment of perforation. For this purpose, the aperture in the membranes should be made as minute as possible, and an assistant specially detailed for this duty should carefully receive in sponges the fluid as it escapes, so as to prevent its entrance into the cavity of the peritoneum. An orifice of sufficient size being thereupon made, the extraction of the child is to be effected with the least possible delay, the feet being seized, and delivery promptly completed. While this is being done, a certain amount of uterine contraction will usually occur, which is an additional reason for speedy action on our part; otherwise, the breach in the uterine walls will become rapidly diminished in size. It has not unfrequently happened that when the body of the child has been successfully extracted, the contraction has been so rapid as to cause the neck to be so firmly grasped as to prevent the completion of the operation, a state of matters in which it is better to enlarge the incision, than to use force, by which we can only succeed by tearing open the wound.

If the placenta is not at once detached, the hand should be immediately introduced into the cavity, and the organ separated from its attachments, and extracted as the hand is being withdrawn. The chief risk of the operation at this stage is, of course, the hemorrhage which necessarily occurs from the uterine sinuses which have been cut through, as well as from the inner surface of that portion of the organ from which the placenta has been separated. The former is the source from which bleeding is chiefly to be looked for; but experience has shown that this risk is very much less than might have been anticipated, the actual amount of discharge depending, in a great measure, on the efficiency of the uterine contractions; and it is certain that, fatal as the operation is in its results, death rarely ensues from hemorrhage. The greatest care on the part of the assistants is necessary, in order to prevent the entrance of the blood and other discharges into the cavity of the peritoneum, and the escape from it of the intestines. Perfect success in this direction is, of course, impracticable; but we may be sure that the less the quantity of such discharges that comes in contact with the peritoneal membrane, the less likely is the dreaded peritonitis to be severe or fatal in its character. The use of antiseptic precautions, as regards the fingers, instruments, sponges, and otherwise, will further reduce this risk. The escape of the intestines may be prevented, and the approximation of the uterine and abdominal walls efficiently maintained, by an expedient which was suggested by Winckel. This consists in having the extremities of the uterine wound hooked upwards by the finger, and thus brought into contact with the walls of the abdomen, a manœuvre which is peculiarly applicable to cases in which the number of assistants is deficient. The probang should finally be passed downwards through the os uteri to the vagina, which insures for the discharges free egress by the normal channel.

Delivery having been by these means effected, the mode of closure and general management of the incisions, uterine and abdominal, is the subject which next engages our attention. When the uterus has well contracted—a process which is materially hastened by pressure of the organ, and even by the application of cold—when all bleeding has ceased, and when the discharges have been wiped away as thoroughly as possible, the edges of the wounds are to be brought into apposition. It is a matter of dispute whether we should or should not stitch the uterine wound. It is quite certain that this is not essential to success, and it is doubtful, as may be inferred from the experience of Winckel, whether or not it is in any way beneficial. Still on ordinary surgical principles, and recognizing the fact that, in a certain number of fatal cases, the wound has been found gaping after death, we cannot wonder that most operators seek in this way to promote union of the uterine tissues. But for one circumstance, the most advantageous procedure would be to bring the uterine and abdominal wounds into close apposition by the same suture; but the circumstance in question is a most important one, and depends upon the contractility and natural involution of the uterine tissue, which would probably involve forcible dragging upon the wound. To effect closure of the uterine incision by means of suture, while the risk referred to is at the same time avoided, has been, therefore, the great object of many of those who have had occasion to perform the operation. Mr. Spencer Wells, for example, in a case in which he performed it with a successful result, passed an uninterrupted silk suture, the end of which he brought through the vagina, and subsequently removed; while Dr. Barnes suggests an ingenious but more complicated method, by which the uterus is stitched and united to the margin of the abdominal wound, while provision is, at the same time, made for the contraction above referred to. But at the present day, we can scarcely doubt that, by many operators, the carbolized catgut sutures will be preferred.

Whether or not the uterine wound is stitched, that in the abdominal wall is, of course, to be carefully closed by suture. The material to which a preference is usually given is fine silver wire, of which five or six stitches are to be passed through the cutaneous and peritoneal margins of the incision; and after these have been carefully adjusted, they are to be drawn tight and fastened in the usual way, additional superficial sutures being, if necessary, added, so as to bring the whole length of the superficial incision into accurate apposition. The carbolized catgut suggested by Professor Lister may be substituted, in part at least, for the silver wire, and prepared gauze or other antiseptic dressings may now be applied.

A full opiate should now be administered either by enema or suppository, and perfect quiet and rest enjoined, the dressings being undisturbed for five or six days. The sutures are to be removed about the eighth day. The vagina may be washed out by injections of weak carbolic solution, and the bladder emptied by means of the catheter twice a day; and, on the fourth or fifth day, the bowels may be relieved by a simple enema. The diet throughout should be of the lightest possible character, and every conceivable disturbing element, bodily or mental, should be scrupulously avoided.

Reference has already been made to the operation of ovariotomy. It must not, however, be supposed that we have any idea of tracing the analogy which exists between the two operations. Hysterotomy, indeed, involves conditions which are manifestly far less favorable than those which attend on an ordinary case of ovariotomy, and we need not wonder that the results are less successful. We cannot, however, avoid the reflection, that not many years ago the latter operation was looked upon as scarcely more promising in its results than that which we are now considering; and, when we reflect

further upon the wonderful improvements which modern surgical skill has effected in the one operation, we are surely justified in expressing a hope that the experience thus gained may be so made available as materially to reduce, in the future, the fearful mortality which, in the past, has attended the Cæsarean Section. Upon nothing will the result be more likely to depend than upon the period at which the operation is performed. If, as has too generally been the case in this country, it is adopted only as a last resource, when the vital powers are exhausted by lingering labor, the expedient is, indeed, a desperate one. But if, on the contrary, the necessity is recognized at a period sufficiently early to enable us to select the time and the conditions which are most favorable, our prognosis will admit of something more of hope.

The shock of the operation is often very great, and may prove fatal at once, before the secondary efforts of peritoneal inflammation have manifested themselves. Hemorrhage is, as we have said, and as the experience of Winckel has shown, by no means a prominent cause of the fatal result; but it is otherwise with peritonitis, which may be looked upon as almost inevitable when the woman survives the immediate effects of the operation. This may come on within twenty-four hours, and is indicated by the occurrence of rigor, severe abdominal pain, with more or less tenderness on pressure, labored respiration, flatulent distension of the bowels, and a rapid, wiry pulse. These alarming symptoms may be combated by fomentations or poultices to the abdomen, mild salines, and opium; but, unfortunately, in the great majority of cases, the symptoms will go on unchecked until, under their influence, the patient succumbs. Metz, of Aix-la-Chapelle, insists upon the importance of the sustained use of cold in averting peritoneal inflammation. The rash employment of this agent would, undoubtedly, as every one knows, rather tend, by reaction, to produce inflammation than to repress it; but of this Metz was quite aware. He recommends that, so soon as the woman has been put to bed after the operation, compresses of cold water should be placed over the abdomen, and that, after a few hours, ice in a bladder should be substituted, while cold injections are thrown into the rectum, and the patient is encouraged to swallow, from time to time, morsels of ice. Under such treatment, he says, the patient is sensible of a feeling of comfort to which she was previously a stranger, and this sensation may be fully trusted to as a safe guide to the length of time, and the extent to which this mode of treatment may be safely carried. So long, then, as the woman remains comfortable, cold may be employed; but the moment she complains of chill or discomfort, the cold is at once to be modified or withdrawn. Cazeaux seems to give a general support to this mode of treatment, which has also been practised by Kilian. Dr. Metz asserts, that of thirteen cases treated on this principle one only died—a statement so glaringly absurd, that we can only suppose this is one of the many pernicious instances of the reckless use of statistics with which, unfortunately, the literature of obstetrics is disfigured, and which sometimes makes us incline to pass by with contempt suggestions which may, nevertheless, have in them the germ of truth and practical worth.

It sometimes happens, as a result of the healing process, that the uterine and abdominal wounds become agglutinated, so as to produce permanent adhesion at this place, without, as would appear, entailing any serious inconvenience. This fact is made use of by those who advocate the stitching together of the two wounds, and there has been proved to exist, in some of those cases in which the Cæsarean Section has been repeatedly performed, an extent of adhesion which has admitted of the performance of the operation without opening the peritoneal cavity; and it is obviously to this fact that the exceptional success attendant on such operations is to be attributed.

Gastrotomy is an operation which has already been alluded to as applicable to cases in which the child has escaped into the abdominal cavity, either from a ruptured uterus, or in cases of extra-uterine pregnancy. Some of the older cases which have been recorded as Cæsarean Section have clearly been of this nature—the operation being, as is obvious, only one stage of the more formidable procedure which we have been considering. There may, possibly, be cases, moreover, as has already been shown, in which, although the cyst of an extra-uterine conception has not been ruptured, it is necessary to perform this operation when the life of the mother is threatened by pressure on important organs, and also under some other circumstances of a like nature.

The operation is simply the first stage of the Cæsarean Section, and it is to be conducted with precisely the same precautions; but an aperture must be left at the lower part of the external wound, to permit of the escape of the discharges by a drainage-tube or otherwise. It might naturally be inferred that an operation, which does not involve the uterine walls, would be attended with much more favorable results. In practice, however, we shall probably, when we take the whole circumstances into consideration, look upon the one with as great apprehension as the other. The operation of Gastrotomy has, in fact, certain special dangers in the practice of midwifery, and is very different, in all respects, from the ordinary operation for the removal of an ovarian cyst. The conditions which attend rupture of the uterus, or of an extra-uterine cyst, have already been detailed, when those accidents were under consideration. In each case, the ovum, its appendages, and the liquor in which it floats, all escape into the peritoneal cavity, along with a large quantity of fluid and clotted blood—a portion of which must necessarily be left behind—so that the chances of peritonitis are probably not less in the one case than in the other. And, in the case of extra-uterine pregnancy, the peculiar anatomical conditions which are often involved in the nature of the placental attachment, are of such a nature as to render these cases specially hazardous. In fact, whatever statistics may seem to prove, and Kilian and a few others may have said, we must always look upon this operation as one of the last resources of our art. When the incision is made in the lateral region, the operation is termed *Laparotomy.*

When the child is extracted by means of incision, practised from the vagina, the operation has by some been termed Vaginal Cæsarean Section, a phrase which is obviously improper. The circumstances which may render necessary such an operation as this, are malignant disease of the os and cervix, congenital occlusion of the os, or retroversion of a gravid uterus. Similar operations, not involving the tissues of the uterus, may be practised in some rare instances of extra-uterine pregnancy, in which the fœtus may be reached in this way; but, in all these cases, the operation is simple, and requires no special directions other than to use bistouries and other instruments so guarded as to incur no risk of wounding the surrounding tissues; and, at the same time, to cut with care, so as to avoid inflicting any injury upon the child.

Symphysiotomy.—In 1768, Sigault, a young student of medicine, at Paris, submitted to the Académie de Chirurgie a proposition that women might be delivered without very great risk, by means of an operation which he thus named. The proposal was received with ridicule, and the essayist was treated as a madman. Nothing daunted, however, by this rebuff, the young Sigault stoutly maintained his position for several years, but it was not till 1777 that he performed his first operation in the presence, and with the assistance of the celebrated Leroy, who, having espoused his cause, ultimately became a warm advocate of the new procedure. Both mother and child were saved in this case, and Sigault soon found himself famous and overwhelmed with benefits, as the discoverer of a method which was to replace the hated Cæsarean Section, and, consequently, as a benefactor of his race. The Académie de Médecine, as if to atone for the indignity which the sister society had put upon him, received him with open arms, and actually struck a medal in honor of the event. In France and Germany the profession was much divided on the subject, but in England it somehow never gained a footing, nor would we even now have given any attention to the matter, were it not that, in all modern Continental works on obstetrics, some degree of prominence is still given to the operation, as one which might, under certain circumstances, be advantageously performed.

The division of the pubic symphysis is, from a surgical point of

view, a matter so simple, that it is unnecessary to particularize the details. It is proper, however, that in expressing as we now do the opinion that the operation is one which must be unhesitatingly and absolutely rejected as irrational, some reason should be adduced for a view which is so confidently expressed. To begin, then, Symphysiotomy is to be rejected as a mere chimerical idea, which had its origin in views as to the movement of the pelvic bones during labor, than which nothing, theoretically or practically, could be more incorrect. It was shown, in an early chapter of this work, that the very trifling movement which nature permits during labor in the human pelvis is one in which the symphysis pubis is the hinge. At the time when Sigault wrote, the idea usually entertained was exactly the opposite—viz., that the hinge was at the sacro-iliac synchondrosis, and that the pelvis gaped at the symphysis; and it could only, of course, have been with the object of encouraging such a movement as this, that the operation could on rational grounds be supported. Again, such an obstruction as might seem to call either for craniotomy, the Cæsarean Section, or this new operation, would, in a considerable majority of all cases, consist mainly in contraction of the conjugate diameter of the brim; but a moment's reflection will serve to show that this operation is not one which is likely to increase the diameter thus encroached upon, for, while it certainly will augment the circumferential measurement of the pelvis, and the transverse and oblique diameters, it leaves the conjugate comparatively untouched. And, if we turn to the results of the operation, we will at once find that the boasted advantage has no existence, save in the imagination of the inventor. Baudelocque says that, in forty-one cases of the operation, fourteen women died, while only thirteen children were born alive. The narrative of recorded cases shows that, while the forces of nature *may* prevail after the operation, it will often be found necessary to apply the forceps, or turn, after the original operation has been completed. As regards ultimate results, Cazeaux says: "In the most fortunate cases, the consolidation of the symphysis is only complete after a lapse of three or four months. Women have been seen in whom it had never taken place, and who, nevertheless, have eventually been able to walk. There then forms, according to Alphonse Leroy, a fibro-cellular tissue which, filling up the gap in the symphysis, maintains the solidity of the articulation."

Various modifications of the operation have been suggested, including one method which has received the support of Stoltz of Strassburg, and which he termed *Pubiotomy*. In this case the operation is performed by a chain saw, which is introduced subcutaneously. A small opening is first made to the right or left of the middle line over the pelvic crest, and through this a strong needle, slightly curved, is introduced. This is passed behind the pubis, and brought out by the side of the clitoris, and by it the chain saw, to which it has previously been attached, is pulled through, and made to act upon the body of the pubis from within outwards, until the bone has been divided. The operation of symphysiotomy has been but once practised, in so far as we are aware, in this country; and on the continent, in the present day, it is so seldom employed that the question may now be looked upon as forming little more than an episode in the history of the operative midwifery of the past.

The operation of *Gastro-Elytrotomy* or *Laparo-Elytrotomy*, which was originally suggested some sixty years ago, has quite recently attracted great attention as a possible substitute for hysterotomy, and several successful cases have been reported in America by Professor Thomas, of New York, and Dr. Skene, of Brooklyn.* In this country it has been twice performed, in both instances unsuccessfully. The main object of the operation is to avoid opening the cavity of the peritoneum, while at the same time the necessity of incising the uterine tissue is obviated. To effect this, an incision is made in the line of the groove from the symphysis pubis to the anterior superior spinous process of the ilium. After the superficial structures have been divided and the peritoneum exposed, the latter is carefully raised from its feeble attachments until the vagina is reached and opened. The bladder must be previously emptied, and carefully kept out of the way by a sound, during the operation, as experience has shown that injury to that viscus is one of the special dangers of the operation. The os and cervix—already considerably dilated either by operation or by natural labor pains—are then hooked into the wound, and the operator, introducing his hand, delivers by turning, the child being extracted through the wound in the abdominal parietes. No special surgical difficulties seem to attend the operation, and it is clear that theoretically much may be said in favor of it. But before definitely pronouncing an opinion with reference to Gastro-Elytrotomy as compared with the Cæsarean Section, it would be necessary to await the results of a somewhat wider experience; but there are certainly, in the present state of the matter, no valid grounds to debar us from anticipating in this a possibly important addition to the operative resources of our art.

* See American Journal of Obstetrics, vols. iii. and x.

It may be interesting at this place, by way of recapitulation—but without any pretence of, or attempt at, anything more than an approximation at accuracy—to set down, in a tabular form, the various conjugate measurements at the brim which, according to the best authorities, may be supposed to indicate the necessity for the several operations which we have now been considering. Burns, speaking of one of the operations referred to, says—and the observation will apply with equal force to any of them—"There is only one degree of disproportion, then, betwixt the head and the pelvis which will admit of this; but the smallest deviation from it destroys the advantage of the operation. Now, as this disproportion is so nice, we cannot in practice ascertain it; for, although we could determine, within a hundredth part of an inch, the capacity of the pelvis, yet we cannot determine the precise dimensions of the head, and thus establish the relation of the two." The student, we would again repeat—at the risk of being accused of unnecessary iteration—must, above all things, beware of assuming that conjugate contraction is his only guide, or one which is uniformly to be relied upon. The following figures, therefore, have reference only to cases of conjugate contraction, in which the other diameters are either unaltered, or are, at least, not very greatly diminished. With reference, more particularly, to the Cæsarean Section, in which osteomalacia is the most frequent cause of deformity, it should be remembered that, in that type of pelvis, the conjugate measurement, so far from being a criterion of the deformity, is more likely to lead the observer to conclusions which are quite erroneous.

With this explanation, then, the following may be given, as showing, according to the most approved authorities, the degree of conjugate contraction at the brim, which may be supposed, under ordinary circumstances, to indicate the various operations which have been described:—

Long Forceps	4 to 3¼ inches.
Turning	3½ to 2¾ "
Craniotomy	3 to 1½ "
Cæsarean Section, or Gastro-Elytrotomy .	1½ and under.

CHAPTER XXII.

PUERPERAL FEVER.—*SCHROEDER.*

UNDOUBTEDLY cases have occurred at all times where lying-in women have been attacked by septic infection and died, and mention of such is made by even the most ancient writers. Hippocrates gives the history of cases which, in all probability, were due to it, and so do Galen, Celsus, Avicenna, and other authors down to the seventeenth century.

But epidemics proper are only mentioned since special lying-in hospitals or special departments in general hospitals have been established. The first institution of that kind, in which men like Mauriceau and De la Motte received their obstetric education, was established in the Hôtel Dieu of Paris. Peu tells us that the mortality amongst lying-in women in that institution was sometimes immense, and especially in the year 1664. At the post-mortem examination the bodies were found to be full of abscesses. De la Motte also mentions an epidemic in the Hôtel Dieu in 1678, and another at the commencement of the eighteenth century in Normandy, especially in Caen and Rouen. In other towns also, where special obstetric departments had been established, the epidemic occurrence of puerperal fever was soon observed. Thus, in 1750 in Lyons; 1760 and 1761 in the British Hospital, London, and in a small private lying-in institution; 1765 and 1766 in the Copenhagen Lying-in Hospital; and in 1767 in that of Dublin, ten years after its establishment. In Germany the first epidemic was observed in 1770 at the Hospital St. Marx of Vienna. In 1772 it occurred in Edinburgh; 1777 in Berlin; 1781 in Cassel, etc., etc.

The greatest ravages were caused by puerperal fever in the Maternité (the separate obstetric department of the Hotel Dieu), where it raged year after year. In 1829, of 2,788 lying-in women, 252 died; in 1831, of 2,907, 254 died. In February, 1831, six to seven women were delivered in one day, all of whom died. In Vienna also puerperal fever raged extensively. In March, April, May, 1823, out of 698 lying-in women, not less than 133 died (19 per cent.), and every two days three deaths occurred; in 1842, in the Vienna Hospital, out of 3,287, 518 died (almost 16 per cent.); in 1846, of 4,010, 459 died; in 1854, of 4,393, 400 died. From these few data, which can easily be multiplied by a great number of similar ones, it will be seen with what severity puerperal fever has sometimes raged in lying-in hospitals.

It would lead us too far to consider all those theories which have been brought forwards to explain the occurrence of puerperal fever, were it only from an historical point of view. Eisenmann and Silberschmidt discuss the subject very completely. More recently two opinions especially have contended for supremacy. According to the one, puerperal fever is due to a miasma formed by the crowding together of puerperal women, and according to the other it is due to the absorption of septic material. The purely miasmatic theory that puerperal fever is due to infection with a specific material formed under atmospheric, cosmic, and telluric influences, which, acting exclusively upon puerperal women, causes puerperal fever, so that puerperal fever rarely becomes a malarial fever—is quite untenable, and now almost universally abandoned. The opinion, however, is still somewhat prevalent, that puerperal fever is, like typhus, of miasmatic origin, and that under suitable conditions the diseased organism may reproduce the virus and propagate it to other predisposed individuals without the original miasma being still active; so that in the course of the miasmatic disease a contagium is generated and propagated to others as the determining cause of the disease.

Latterly, the view that the origin of puerperal fever is due to the absorption of septic material from the surface of the wound has gained more and more adherents, and this view will be accepted in the present work. It is based upon a large number of observations, which, as Hirsch remarks, "have partly, at least, the conclusive evidence of experimental demonstration; and if, in the etiological research, with a correct appreciation of the known facts, the mathematical precision of a proof is for the present renounced, there are few questions of etiology which are able to be solved in a more unbiased and certain way." In fact, whoever, after he has carefully perused the treatises of Veit and Hirsch on the subject, still doubts the possibility of the origin of puerperal fever by the absorption of decomposed organic materials, is not to be convinced. It was, therefore, thought unnecessary to give even a digest of the numerous reasons and observations, and only a few striking cases will be related, which differ from experiments performed on animals only in so far that they were performed unconsciously, and not with the intention to infect.

The opinion which we follow originated with the English, and has been still further worked out by German physicians.

Denman was the first who contended that physicians and midwives who attended to cases of puerperal fever propagated that disease to other puerperal women. A great number of proofs of manual propagation soon accumulated in England, and many observations were made known where puerperal women had been infected by accoucheurs who attended, not only puerperal fever cases, but also cases of phlegmonous erysipelas and of ichorous wounds. It had, therefore, become the custom with some English physicians to give up practice for some time, if one of their puerperal patients suffered from puerperal fever. Semmelweiss has the merit of having worked out the subject carefully and pointedly, with special reference to lying-in hospitals, and he deserves to be mentioned amongst the first of the benefactors of man. In 1847 he first stated that puerperal fever depended upon an infection with cadaveric poison, an assertion which can easily be seen to be one-sided and insufficient; but he himself corrected his opinion afterwards, and what is now known of the etiology of puerperal fever is essentially due to Semmelweiss.

A.—*Definition and Origin of Puerperal Fever.*

Under the term puerperal fever we place all those diseases of puerperal women which are caused by the absorption of septic matter, that is, organic substances in the process of decomposition.

That absorption may take place, a fresh wound is required by which the septic poison can enter. Through the intact skin or mucous membrane, through the lungs or intestinal canal, septic materials, as a rule, never enter the blood as such, although a long sojourn in an atmosphere loaded with gases the product of organic decomposition can give rise to chronic illness. But fresh wounds exist in every puerperal woman. In every one some of

the maternal blood-vessels are opened up by the detachment of the placenta, and in almost all there are slight lacerations of the cervix and vulva.

The sources from which the infecting matter is derived are chiefly twofold; either it belongs to the infected organism itself—auto-infection, or it is introduced from without—external infection.

Auto-infection is possible in all cases in which parts of the maternal organism decompose during or immediately after delivery. This decomposition occurs very readily and rapidly in disintegrating new growth, as carcinoma of the cervix; it may also be produced by mortification of the maternal soft parts which have been exposed to great pressure, or through pieces of the membranes or placenta which have remained within the genital canal. The latter, however, is a comparatively rare cause of auto-infection, because, to produce the infection, a recent solution of continuity is required, which, as a rule, does not occur a few days after delivery, when the ichorous decomposition begins. The wound at the placental insertion is then closed, and the lacerations of the mucous membrane have united by first intention, or have become granulating ulcers; but the proliferating granulations prevent absorption. Under exceptional circumstances a wound may remain capable of absorption, or a fresh excoriation of the mucous membrane, or the destruction of the granulations, may lead to inoculation.

The most favorable conditions for auto-infection exist at the time when the wounds are fresh, that is, when at the birth of the child there are already decomposed materials. This is especially the case (1) when the dead fœtus, still contained in the uterus, has, after the rupture of the membranes, been exposed for a long time to the influence of the atmosphere. (According to our experience, a macerated fœtus, if the access of air has been prevented, does not infect.) (2) When the pressure upon the maternal soft parts has lasted so long that gangrene sets in before delivery is terminated. (3) In carcinoma of the cervix, where the new growth readily undergoes putrefaction. Auto-infection rarely takes place when the bruised maternal soft parts decompose somewhat later, since the recent wounds have then ceased to be capable of absorption. This is so because the mortified parts are separated from the healthy tissues by the line of demarcation which does not absorb. The partial gangrene of the hymen sufficiently proves that, as a rule, the line of demarcation prevents the absorption of putrefying substances by the neighboring healthy tissue. In every primipara it can be seen that by the pressure of the child's head some portions of the hymen are changed into a bluish-black mass. These portions mortify in a few days; and later, instead of the prominent lips, small ulcers are found. But since the gangrenous parts are thrown off a few days later infection does not follow. Billroth has shown by experiments that granulating sores do not absorb as long as the infecting agent does not destroy the granulations.

Infection from without takes place when septic materials are brought to the recent wounds of the genital organs by means of a sponge or of linen used for cleaning the parts, or by instruments, and very frequently also by the examining finger. It is possible also that septic substances floating in the air of the lying-in room may come in contact with the recent wounds; yet those substances never exist as gaseous miasms, but rather as organic compounds suspended in the air. On the whole, there are no cogent reasons for such an assumption.

The infecting matter is derived from a great variety of sources. It is formed everywhere where organic compounds decompose; therefore it is derived from dead bodies, from suppurating wounds, disintegrating neoplasms, and especially from the secretions of diseased and sometimes also of healthy puerperal women. Puerperal fever, therefore, is nothing else but poisoning with septic matter from the genital organs.

This definition first of all shows that there is nothing specific in puerperal fever. Where the products of putrefying organic matter enter living tissues the consequences are essentially the same. Puerperal fever is quite the same state which is frequently observed in surgical wards, and designated as erysipelas, pyæmia, ichorrhæmia, and septicæmia. A specific difference does not exist, although there are modifications in the symptoms; but they are due in a greater measure to the peculiar place where the septic material enters, and in a lesser degree to the changes of the genital organs in the puerperal state.

Infection with septic materials arising from the female genital organs occurs as a rule only in the puerperal state. Exceptionally it is seen also after gynæcological operations. It is then followed by the same changes as in the puerperal state, as is shown in the very interesting cases communicated by Buhl. Changes were found in every respect like those following puerperal fever in the post-mortem examinations of two girls upon whom episioraphy was performed, and in two others in whom the vaginal portion of the uterus was amputated on account of carcinoma.

That there is nothing specific in puerperal fever is shown also by the fact that puerperal women can be infected and puerperal fever produced in them by patients with phlegmonous erysipelas or with suppurating and ichorous wounds. It has also been observed in lying-in hospitals that, at a time when puerperal fever was prevalent, phlegmonous erysipelas developed in pregnant women and nurses, who, having slight excoriations, came in contact with the diseased puerperal women. The septic infection can also be transferred to the newly-born child, and its action is most frequently favored by the umbilical wound. The consequences are erysipelas of the abdominal walls, disintegration of the thrombi of the umbilical vessels, even peritonitis and inflammation of the subperitoneal connective tissue and ichorrhæmic metastasis into other organs. It is rather common to see during an epidemic of puerperal fever phlegmonous inflammations arising from small excoriated places on the hands and feet of new-born children. From all these facts we may conclude that puerperal fever is really not contagious, for by a contagious disease is meant one in which a specific poison is produced within a diseased organism, and which, transferred to other individuals, always produces the same specific disease, such as measles, scarlatina, smallpox, syphilis, etc. Although the secretions of puerperal fever patients transferred to other puerperal women may in them produce puerperal fever, there is nevertheless nothing specific in the secretion. Those secretions have only all the characters of the products of decomposing organic compounds, and the phlegmonous inflammation and the septicæmia which they produce in any wound exactly corresponds to the puerperal fever of puerperal women. If, therefore, puerperal fever cannot be considered contagious in the usual sense of the word, yet it must be admitted that it is manually transferable.

B.—*Pathological Anatomy of Puerperal Fever.*

We shall first consider the changes at the place of infection, and the way in which the disease extends by continuity of the tissues.

It has already been stated that the infection may start from various places. No doubt the part where the placenta was inserted is able to absorb septic matter, yet this rarely takes place, because the infecting agent does not commonly reach it.

Infection takes place much more frequently through the lacerations of the cervix. They are, though slight, scarcely ever absent in any case of labor, and the examining finger, as the bearer of the infection, easily passes up to them. In the great majority of instances the infection is favored by the slight rents in the mucous membrane, to which all primiparæ and most pluriparæ are subject when the head appears in the vaginal outlet. In every case of labor the examining finger of the accoucheur or midwife frequently passes through this portion of the vagina. The septic matter brought by the finger is easily deposited there, and, if slight solutions of continuity exist in the mucous membrane, the poison is absorbed. It only exceptionally occurs that infection is produced by the absorption of the mortifying portions of the maternal soft parts by the surrounding living tissues; it is met with more fre-

quently when the wounds are recent over which the putrid secretion passes.

Very often the edges of the wound begin to ulcerate, forming the so-called puerperal ulcer. This is, of course, situated at the place of the wound, usually, therefore, in the vulva, on both sides of the labia, or behind the frenulum. Lacerations of the perinæum also are easily changed into ulcers, and heal up later on by second intention. We often find, however, ulcers in the vulva, whilst the lacerations of the perinæum have healed by first intention. Then the inoculation had not taken place at the perineal wound, and it was able to unite before the putrid secretion passing over it could convert it into an ulcer. The same can be seen in the lacerations of the cervix, and in considerable endometritis also at the placental insertion. The ulcer has tumid edges, the base is covered with a dirty yellow coat; it has a tendency to extend, and heals only very slowly when the coating is thrown off and fine granulations appear at the base. Still more advanced changes, in the cervix and at the placental insertion discovered at the post-mortem examination, show the ulcers to be covered by a diphtheritic, brownish-green scar.

If the inflammation extends along the surface the mucous membrane of the vagina becomes swollen, and the submucous tissue is the seat of a more or less extensive œdema. The mucous membrane in colpitis feels soft and infiltrated; the greatest swelling is around the ulcers, and usually considerable œdema of the labia pudendi is met with. The process is the same as takes place in the skin, and is known as erysipelas, and Virchow, therefore, has called it *erysipelas malignum puerperale internum.* It is not improbable that the same process sometimes extends also to the labia pudendi, the nates, and the neighboring parts of the thighs; yet in women recently delivered the diagnosis is very difficult, as those parts are already, as a rule, of more than a rosy color. The great œdema of the labia and the sloughing which sometimes arise after a few days, attended by high fever, favor that view. Then between this inflammation, extending along the surface of the mucous membrane and the phlegmonous process, attaching the subjacent connective-tissue layers, there exists no radical difference. Both consist in the infiltration of the tissue by small cells (derived, according to former views, from the proliferation of the connective-tissue cells, and, according to Cohnheim's observations, due to the migration of the white blood-corpuscles from the vessels), attended by great hyperæmia and serous transudation. Volkmann's and Steudener's researches have shown that in simple erysipelas this process does not remain limited to the rete Malpighii, but that it extends into the subcutaneous connective tissue, as in the phlegmonous variety of erysipelas.

The inflammation produces only palpable changes in the uterine mucous membrane. When it is very intense in the normal puerperal state the inner surface of the uterus has the appearance of intense catarrhal inflammation. When portions of the uterine mucous membrane rapidly mortify the endometritis assumes a diphtheritic character. The aspect of the mucous membrane varies according to the extent and the depth of that necrosis. If large shreds of the decidua have remained behind they become œdematous and form rounded projections.

The superficial layers mortify in patches or in larger masses, and between the normal mucous membrane yellowish-brown places can be seen, from which masses of detritus can be scraped off with the knife. The place of the placental insertion mostly projects into the uterine cavity, but is, on the whole, little changed. If the entire inner surface of the uterus becomes necrosed, there will be found everywhere, according to the state of the serous transudation into the organ, either brownish particles or a smeary mass of chocolate colour, after the removal of which the deeper layers of the mucous membrane or the muscular fibres themselves are laid bare. The place of the placental insertion also participates in these changes. It is then covered either by a thick scar or after the disintegration of the thrombi it shows the smooth muscular layer and the gaping openings of the veins.

Under such conditions the uterus itself is never quite unaffected. It is either only slightly contracted or its whole substance is œdematous. In the severe forms of the disease we almost always find, either in the uterine parenchyma or close to its margins, distended lymphatics with purulent contents, the origin of which cannot infrequently be traced to the unhealthy ulcers of the cervix. The lymphatics are sometimes found to have partial dilatations of the size of a nut, which are filled with pus. They look like abscesses in the uterine parenchyma, and can only be distinguished from such by their smooth walls, since the afferent and efferent vessels cannot always be found.

As a rule, the inflammation does not extend to the mucous membrane of the Fallopian tubes, and even in very intense affection of the lining membrane the tubal mucous membrane remains normal, or only in a state of slight catarrhal inflammation. Occasionally a purulent salpingitis occurs, and this may lead to peritonitis, either by the propagation of the inflammation or by rupture of the tube through purulent effusion. However, in a great many cases the peritonitis arises from other causes.

If the whole of the lining membrane of the uterus is converted into a pultaceous mass the parenchyma also becomes implicated in the process. If the endometritis is more intense there are usually also changes in the uterine parenchyma which constitute metritis. They consist of an œdematous condition and a cloudy swelling of the whole organ. The uterus is then badly contracted, and is so soft that the pressure of the intestinal coils resting upon it leave their impression. The transudation is either purely œdematous, more frequently, however, it is cloudy, albuminous, of a finely granular aspect, sometimes also tinged with blood. If the ichorous endometritis extends deeper, a portion of the uterus also mortifies (putrescentia uteri), and this may lead to perforation into the abdominal cavity.

In other though very rare cases a copious proliferation of cells in circumscribed spots of the uterine parenchyma leads to the formation of abscesses, which terminate in caseous inspissation or in perforation. They are distinguished from the lymphatic dilatations filled with pus by the absence of a smooth lining membrane and by their more winding and less round shape, but have, no doubt, been frequently mistaken for them. Although under certain circumstances the inflammation may be propagated from the uterus to the surrounding connective tissue, yet parametritis usually arises in another way. The inflammatory process due to the infection extends less along the surface of the mucous membrane, but follows from the place of infection (which is, as a rule, the vaginal outlet) the course of the connective tissue situated around the vagina and uterus.

This affection of the connective tissue is perfectly identical with the phlegmonous process not infrequently observed in the connective tissue of the extremities. It consists in an acute inflammatory œdema. The connective tissue swells and becomes somewhat cloudy and opaque; in severer forms the swelling increases, the whole tissue is tumid, and their interstices filled with serum, frequently also with a gelatinous, semi-coagulated material. There is besides a copious infiltration of the tissue with small cells.

This diffuse acute œdema occupies all the pelvic connective tissue. It commences, as a rule, round the vagina, extends higher up, and also attacks the whole subperitoneal tissue, so that the peritoneum itself appears to be somewhat raised from its basal structure. It may also extend to the iliac bones, behind to the connective tissue around the kidneys, even to the diaphragm, and to a large portion of the anterior abdominal wall. More rarely the process extends to the connective tissue accompanying the larger vessels and nerves of the lower extremity, and produces the swelling of the thigh known as phlegmasia alba dolens. The most considerable swelling is usually under the portion of the peritoneum lining the pelvis, for here all the conditions appear to favor the swelling. After delivery the circumference of the uterus has greatly diminished, and therefore the pelvic portion of the peritoneum is still too large, so to speak, for the pelvic organs, although the elasticity of

the membrane prevents the formation of folds. The cellular tissue between the two layers of the ligamentum latum is, on account of its looseness (during pregnancy the broad ligaments unfold and cover the sides of the uterus), especially liable to swell from the inflammatory œdema. As these places are easily accessible to the combined external and internal examination, the diagnosis of inflammation of the pelvic connective tissue can be made from the condition of the broad ligaments. The peritoneum, however, adheres closely to the uterus, and a considerable exudation is therefore impossible.

In mild uncomplicated cases the process always terminates in recovery, and the œdema rapidly disappears. Where the formation of the cell-element is slight hardly a trace of a change is left behind. If, however, cellular elements accumulate in larger masses they, as a rule undergo fatty degeneration; and whilst the liquid constituents are rapidly absorbed, a hard tumor remains, consisting of finely granular detritus which under favorable circumstances may also be absorbed in the course of a few weeks. In comparatively rare cases the cellular infiltration becomes so thick at a limited spot that an abscess forms, which terminates in the way described below.

A still more intense infection may be followed by a kind of necrotic softening of the subserous connective tissue. The peritoneum is then found to be raised from the subjacent structures, the connective tissue itself infiltrated with an opaque serum, of a dark brownish-red or chocolate color, due to an imbibition with hæmatin and to putrefaction, evolving a putrid odor. The necrotic connective tissue may also be thrown off, as has been observed in a case where the patient succumbed to a putrid pulmonary abscess, whilst an intense general peritonitis tended to recovery. The retro-peritoneal connective tissue above the left ilio-psoas muscle was found as a white necrosed shred about one foot long, perfectly free, in a cavity beneath the peritoneum.

In many cases of parametritis thrombosis of the lymphatic vessels is found within the inflamed spot. The coagulated lymph either uniformly fills the vessels or gives the appearance of a string of beads. Sometimes also single larger dilatations of lymphatic vessels are seen, like those of the uterus described above. The thrombosis may be due to the direct influence of the infecting matter, but more frequently it is caused by the inflammation of the connective tissue around the vessel. The products also of the inflammation of the connective tissue have a tendency to coagulate, and the contents of the lymphatic vessels participate in the process.

The significance of the thrombosis of the lymphatic vessels has been variously interpreted. Whilst Hecker and Buhl ascribe to the inflammation of the lymphatics all the pernicious characters of puerperal fever, Virchow, on the contrary, was the first to show that the lymphatic thrombosis is to some extent a favorable incident, since the occluded vessels are thus prevented from transporting the infecting substances; and, in fact, the nearest group of lymphatic glands is alone found to be inflamed; the inflammatory process is there at least delayed, and the rest of the lymphatic system is in this way shielded, as it were, against infection.

The lymphangitis, therefore, cannot any longer be considered the principal and essentially pernicious alteration. It is an accidental change, which usually remains limited to the spot of inflammation, and may heal. Very rarely the thrombosis extends further upwards towards the thoracic duct; if so, there are always other very considerable changes. We have seen a healing process going on in the thrombosed lymphatics in the body of a puerperal woman who died after a general peritonitis had begun to subside. The contents of the dilatation were no longer purulent, but formed an inspissated yellow ball.

In more intense parametritis the ovaries also, which are in direct continuity with the connective tissue, participate in the inflammation, and oophoritis develops. It is, however, almost always of minor importance, an affection of secondary consideration, in so far as it does not materially determine the character of the danger. In cases of putrid decomposition of the subserous tissue the whole ovarian stroma is sometimes seen to be entirely disintegrated, and on incision of its coat the whole contents escape as miscolored serum from a cyst. In such cases all the other changes are also very considerable, and the affection of the ovaries is then, if not less in intensity, at any rate less in extent. Only very rarely abscesses form in the ovaries, which perforate either early or acquire an enormous size and later perforate externally or into adhering neighboring organs.

The neighboring layers of the uterus also become in considerable parametritis the seat of an inflammatory œdema. This is distinguished from that of endometritis by the pathological changes being more pronounced in the external layers.

As in parametritis the connective tissue close beneath the peritoneum is affected, it is easily intelligible why the serous membrane itself becomes implicated in the inflammation. In a less virulent infection, and in slight and very gradual swelling, pain, the surest sign of the implication of the peritoneum, may be absent. If the swelling is more considerable the dragging upon and the changes in the position of the peritoneum cause an irritation. Symptoms of perimetritis follow, or, more correctly, of pelvic peritonitis, as the peritoneum covering the uterus is less affected than the other portions lining the pelvis. In fatal cases the inflammation rapidly extends to the peritoneum, and soon a general peritonitis is established.

Pelvic peritonitis, as a rule, consists only in an inflammatory irritation of the serous membrane without much exudation, or pseudo-membranes are formed, which lead to adhesions between the organs contained in the pelvis. Their cicatricial shrinking may cause a change of position of the organs, and give rise to a variety of complaints. More intense inflammation may cause intra-peritoneal suppuration, which, when encapsuled, is only very gradually reabsorbed, or the inflammation extends to the whole peritoneum.

General peritonitis arises most frequently in the course of parametritis or pelvic peritonitis in the way described above, and is rarely a consequence of ichorrhæmia. It rarely follows endometritis, so that the inflammation is propagated to the peritoneum through the parenchyma of the uterus or the Fallopian tubes.

In recent and relatively mild cases the whole peritoneum, and especially that enveloping the intestinal coils, is finely injected, and the contents of the abdominal cavity are loosely adherent to one another by means of pseudo-membrane. The exudation is sometimes small in quantity, almost purely serous, and containing few pus-corpuscles. In other cases, again, there are limited patches of pus, or thick yellow membranes of coagulated fibrine have formed, which everywhere cover the organs. The liver has usually a thick coating, and the uterus, except where it is in close apposition to the intestinal coils, is covered by the exudation. The intestines are distended on account of the meteorism and the diaphragm is pushed upwards.

In the most fatal cases due to ichorous parametritis there is no fibrinous exudation. The abdominal cavity contains a thin, brownish, discolored fluid, of a very putrid odor. The intestinal coils have a dark, brownish-red appearance, the same as in incarcerated hernia. These cases always terminate in death. If the exudation, however, is serous, purely fibrinous, or purulent, recovery may take place. The exudation is then either reabsorbed or encapsuled, or it is gradually inspissated; but the pus may sometimes perforate the intestine, and, from the subsequent escape of fæcal matter into the abscess, a putrid peritonitis follows, or, whilst the pathological changes undergo a retrogressive metamorphosis tending to recovery, a fresh exacerbation causes death.

The peritonitis may also extend through the diaphragm to the pleura. More frequently, however, the pleurisy, as well as the peritonitis itself, is the consequence of ichorrhæmia.

We must now consider the way in which the whole organism is infected, that is, the changes which take place generally, and are not the result of the inflammation spreading by continuity of tissue. It must be borne in mind that the inflammation of more distant

organs in puerperal fever arises in the same way as it does in infection after injuries of other parts of the body, and as in surgical diseases.

Experience has shown that in cases of intense septic infection death may take place in a very short time, and that the post-mortem examination reveals no other distinct microscopical changes than that the blood is dark and non-coagulable, and ecchymoses into various tissues. By an examination of the elementary structure of any organ the commencement of an acute inflammatory process is seen, viz., fine granular infiltration (the so-called cloudy swelling), fatty degeneration, or even disintegration of cells. The experiments of C. O. Weber, Billroth, and many others, have shown that septic matter has pyrogenetic and phlogogeneous properties, that is, it is capable of producing fever and local inflammation. The theory, therefore, is that in cases of acute septicæmia such a quantity of septic matter has been absorbed that the blood has received phlogogeneous properties, and that it is able to produce inflammatory changes wherever it goes. Such a general inflammation of the whole organism, and especially of those organs, the undisturbed function of which is necessary for the preservation of life, must be able to destroy life before more palpable changes have developed in individual organs. Accordingly, in such cases, functional disturbances of the organs are alone observed during life, and after death only the commencement of parenchymatous inflammation of those organs, the cloudy swelling of the cells.

In other cases the infection of the blood is not so intense; fever is the sole symptom of the general disturbance; the functions of the organs important to the maintenance of life are not so disturbed that death must inevitably follow. If infecting matter has only once been absorbed into the blood the disturbances caused by it soon pass off, as shown in numerous experiments on animals; the poison is rendered innocuous within the organism or eliminated from it. Such is the case when putrid matter has been once injected into the blood. By infection from a wound the absorbed matter has still another effect; locally, around the wound, it sets up an inflammation progressive in character, the acute inflammatory œdema, with a tendency to extend along the connective tissue. In this inflamed spot, again, materials are produced by the disintegration of tissues, equally possessed of pyrogenetic and phlogogeneous properties. Continually small quantities of these materials are absorbed into the blood, and thus the fever sustained. At the same time the blood, now possessed, although in a slight degree, of phlogogeneous properties, may also cause inflammation in other organs, predisposed to inflammation, either on account of their anatomical condition or on account of the idiosyncrasy of the patient. Such organs are chiefly the large abdominal glands and the serous membranes, also the striped muscles and the connective tissue. Whilst the process previously described as consisting of a uniformly acute degeneration of all the organs has been called septicæmia, the one just mentioned, where the process is more chronic and limited to individual organs, has been called ichorrhæmia. A specific difference between the two does not exist, it is only one of degree; for where septicæmia has not quite an acute course it ceases to be a pure intoxication with the originally infecting agent, but the infection of the blood is now aided by the absorption of the products of the local inflammation, which products, however, are not specifically different from the original agent. On the whole, septicæmia may be considered the acute, ichorrhæmia the chronic, or rather subacute septic infection.

There is still another way in which the whole organism can be affected from the local disease. It may happen that pieces of a thrombus which had formed in a vein may enter the circulation, and be arrested in an artery and there cause inflammation. Thrombosis of the veins, however, has properly nothing to do with septic infection, and apart from any infection a piece may be torn off a thrombus, and, entering the circulation, may be arrested in the pulmonary artery as an embolus. Embolism, therefore, is not a disease due to infection. But, in reality, the case is different. It certainly rarely occurs that particles are torn off a healthy parietal thrombus, which occludes a venous branch and projects somewhat into the main vein. If it occurs, and the embolus is arrested in the lung, under normal conditions it usually becomes encapsuled, and the area supplied by the occluded blood-vessels is in a collateral way again brought within reach of the circulation. But the case is different if the tissue around the thrombosed vein is the seat of a phlegmonous inflammation. Under the influence of the surrounding inflammation the thrombus disintegrates, and the products of disintegration easily enter the circulation. Recklinghausen and Babbnoff have shown that wandering cells pass through the walls of the vessel into the thrombus. If such a particle is arrested in the lung under the altered conditions of the diseased organism, a hæmorrhagic infarct is formed, that is, a stasis in the vessels at the periphery of the occluded spot; and the embolus itself now produces inflammation in its vicinity, which is like to that which caused its own disintegration, and therefore either purulent or ichorous. In point of fact, infection is highly conducive to the origin of embolic centres, but the latter are always complications only of ichorrhæmia, and embolism itself is an accidental affection, not directly due to infection.

A priori it may appear that in puerperal women embolic centres ought to be of frequent occurrence, since there is always thrombosis of the blood-vessels at the placental insertion, and, as Virchow has shown, all the conditions are present which favor the formation of thrombi by compression and dilatation. But this is by no means the case. They appear to be more frequent in surgical cases; and even in diseased puerperal women, in whom embolic centres occur, these appear not to have arisen in the great majority of instances from the sources above mentioned, but from veins which become secondarily thrombosed within a phlegmonous centre.

There is also another important question, whether the circumscribed inflammation of individual organs is exclusively due to embolism or whether they may be a consequence of ichorrhæmia. It must be decidedly admitted that circumscribed lobular inflammation may also arise independently of embolism. Virchow also, although with a certain reserve, has given it as his opinion that he did not consider it improbable; whilst Billroth and Waldeyer derived all circumscribed metastatic inflammations from embolism, although they themselves confess that an exact demonstration of an embolus can very frequently not be made. According to our own observations, circumscribed inflammation of various organs undoubtedly arises independently of embolism, and we ascribe to ichorrhæmia also the power of producing lobular inflammation. It may certainly be very difficult to distinguish between them and embolic centres. In doubtful cases the presumption is in favor of embolic origin in inflammation of the lung, and in that of other organs in favor of ichorrhæmia.

The anatomical appearances in the dead body after infection of the whole organism are, therefore, very variable. In extremely virulent and rapidly acting infection—acute septicæmia—the parenchyma of the most vulnerable organs is found in the stage of cloudy swelling, the commencement of parenchymatous inflammation. They are often also numerous extravasations of blood, especially beneath the endocardium and the mucous membrane of the intestinal canal, together with catarrh of the latter; both of them are regularly met with in septicæmia artificially produced in animals. In the less intense and more chronic action of the virus —in ichorrhæmia—there is especially diffuse or circumscribed parenchymatous inflammation of the large abdominal glands and purulent inflammation of the serous membranes. There is also acute œdema of or abscesses in the connective tissue, partial inflammation of some muscles, and abscesses of the lymphatic glands. In fatal cases of septicæmia circumscribed centres of embolic nature are rarely found in the lungs, and in other organs they are never found if it has run a very rapid course. They are very frequently met with in ichorrhæmia.

We must, however, limit ourselves to mentioning briefly the most important changes that are met with in some organs.

Amongst the serous membrane the pleura is, with the exception

of the peritoneum, most frequently the seat of inflammation. Of peritonitis, and the possibility of its origin by ichorrhæmia, we have already spoken. Pleurisy is uncommonly frequent, but does not always arise from ichorrhæmia. It is not infrequently due to perforation, or to a mere propagation of inflammation from an embolic centre in the lung or from pneumonia of another kind. But it may arise also, as shown by the inflammatory œdema of the intermediate layers, by continuity of tissue, the inflammation of the peritoneum being propagated through the diaphragm. We have seen it once caused by the perforation of a purulent abscess of the spleen into the pleural cavity. Pericarditis externa is often connected with pleurisy of the left side. The pleurisy may be of an adhesive character, and thus thick adhesions will be formed, which are sometimes gelatinous from serous transudations, or there is a fibrino-purulent coating, or very frequently a copious serous or purulent exudation, sometimes even discolored and putrid.

Inflammation of the cerebral membranes is comparatively rare. The internal surface of the dura mater is covered with a gelatinous fibrino-purulent exudation, the pia mater variously altered, from a slight injection and slight œdematous opacity to a purulent meningitis. Virchow found in one case a purulent opacity of the posterior cornu of the left lateral ventricle.

Inflammations of the joints are far more frequent. The shoulder and the knee-joint are most frequently attacked, but the wrist, the elbow and the hip may be the seat of a purulent inflammation as well as the others. In one case there was pus around the shoulder-joint, without the joint itself being implicated. Pus accumulated in the joint may perforate and undermine the surrounding soft parts to a great extent.

Endocarditis has often been seen in ichorrhæmia and septicæmia. The endocardium is finely vascular, and beneath it are extravasations of blood, which extend into the muscular coat. It may lead also to papillary proliferation of the epithelium, ulceration of the valves, and consecutive embolism. We have once seen circumscribed endocarditis arise from a putrid thrombus, which had been arrested under the inner segment of the mitral valve.

We have already mentioned that the lungs are the most frequent seat of embolic infarction and of abscesses of the known cuneiform shape; for under the influence of the infection the thrombi, as a rule, disintegrate into very small particles, which enter the circulation, and are arrested in the finer branches of the pulmonary artery; in it are often found embolic centres, not very numerous, and seldom large. Thrombi of such a size that they are arrested in the larger branches of the pulmonary artery are a rare occurrence in septic infection. We have, however, seen it once in the body of a puerperal woman, in whom the general peritonitis had subsided, and where the thrombosis of the inguinal and crural veins extended up towards the third lumbar vertebra; very large emboli had been arrested in most of the larger branches of the pulmonary artery, although not completely blocking up the vessels. One branch only was pervious, that leading to the left upper lobe. At the place of division of the artery which supplied the left lower lobe a large discolored old embolus was found. The same was the case in the pulmonary branch of the right lung, yet those emboli did not perfectly occlude the arteries. Perfect obstruction was only found in some small branches, but in the areas supplied by them infarcts were by no means always found, so that the latter were not numerous, and the greatest part of the lung was only the seat of very intense œdema.

Besides embolism there is often lobar and lobular pneumonia of ichorrhæmic origin. The exudation is rarely of a purely croupous character, mostly somewhat serous and discolored, and seldom occupies only one lobe and this exclusively; more frequently the greater part of one lobe is infiltrated, and in the other are found lobular infiltrations of the same kind. The greatest tendency to pulmonary gangrene is caused by the presence of putrid emboli, but in discolored pneumonia also the pulmonary tissue may disintegrate.

The spleen is most frequently enlarged, the pulp soft, greasy, of chocolate color, and rarely perfectly liquescent; in other cases there are lobular infiltrations of an ichorrhæmic nature. Embolic centres in the spleen are equally rare.

The liver is seldom perfectly unaltered. Besides embolism all stages of commencing cloudy swelling of the liver-cells to their perfect disintegration—acute yellow atrophy—are observed. These changes are rarely uniform throughout the whole organ. There is chiefly a far-advanced fatty infiltration, or the already perfect disintegration of cells with relatively or quite intact portions. The fatty infiltration is recognized on section by the clearer spots, which contrast with the brown parenchyma, but the transition into the latter is usually indistinct.

In the kidneys also embolic centres are met with, as well as other circumscribed and diffuse inflammations. The epithelium of the uriniferous tubuli is infiltrated with fat and disintegrated. Cloudy swelling is very commonly met with, and sometimes also, in the cortical portion, degenerative processes.

Buhl saw in one case a parenchymatous inflammation of the pancreas with disintegrated glandular cells as in the liver.

There are also suppurative and putrid inflammations of the parotid glands and of the mammæ, and in strumous cases of the thyroid also. These probably are only exceptionally due to embolism, and they contain either pure pus or a thin putrid secretion.

Inflammation of the eye is most frequently caused by embolism. It begins with swelling of the eyelids, hyperæmia, and hemorrhage; the cornea and the iris become opaque, pus is formed, the cornea ruptures, and the process terminates in destruction of the eyeball.

The lymphatic glands may begin to suppurate later on in the course of the disease. The inguinal and the axillary glands are the most commonly implicated.

Purulent inflammations of the muscles and the connective tissue of the extremities are also met with. The cause may sometimes be embolism, but not always so. These abscesses usually contain pure pus, but sometimes the primitive fasciculi of the muscles (also of the heart) are broken down into the molecular detritus, and in the connective tissue circumscribed softened spots also appear, which break and discharge a thin matter with necrotic shreds. The acute swelling of the connective tissue may quite subside.

The intestinal tract is in many cases (even where no calomel has been administered) the seat of a catarrhal inflammation with hemorrhage, and occasionally also of ulcerations of the mucous membrane, due to hemorrhagic infiltrations. The same kind of ulcer, due to the same cause, is also found in the bladder. Diphtheritic enteritis is rarely seen.

If we add to the above the inflammations of the skin which occur as circumscribed hyperæmia or as pustules, we shall have mentioned all the more important metastatic centres which, either of ichorrhæmic or embolic nature, occur in the puerperal state, and also in all the organs of the body. (Erysipelas is always due to direct infection, either at the originally infected place at the vulva, or by inoculation at a place of injury. We have seen it start twice from an excoriation of the left nostril.)

It has already been mentioned that at times, when puerperal fever is epidemic, the new-born child also dies of septic infection. This as a rule, starts from the umbilical wound (doubtless by manual inoculation), and has a similar course to that of puerperal fever in the mother. There is either erysipelas of the abdominal walls, or the inflammation extends from the connective tissue of the umbilicus to the subperitoneal tissue, and causes a secondary and fatal peritonitis. The vessels and the structures in their immediate vicinity may suppurate or mortify. In the umbilical arteries disintegrated thrombi are found. Embolic centres in other organs are very rare, but ichorrhæmic pneumonia is rather frequent.

c.—*Symptoms and Course of Puerperal Fever.*

The outbreak of the disease essentially depends upon the period at which infection has taken place. This, as a rule, occurs during the expulsion of the fœtus or in the stage of the afterbirth, but sometimes also at the commencement of labor, and even during

pregnancy; for at an early period of labor the os uteri may be already lacerated, and even during pregnancy, when the internal os is patulous, the examining finger may open some of the absorbent vessels by the separation of the decidua, which is shown by the blood covering the finger when withdrawn after an examination.

If infection takes place during gestation this is, as a rule, interrupted. Infection is a rare occurrence a few days after delivery, when the small lacerations have cicatrized, or have begun to form granulations; but it is, nevertheless, possible, because the granulations can be easily destroyed and the recent cicatrices irritated. If, as is usual, the woman is infected in the last stage of her delivery, the first part of the puerperal state passes quite normally. The temperature during and after birth depends exclusively upon the process of labor; even in infected women, if labor has not given rise to any considerable disturbance, the temperature is normal, that is, it rises within the first twelve hours, and in the second twelve hours it again falls very commonly to below 37° C. The pulse may also be slow, not infrequently from 60 to 70 in the minute, but sometimes it is frequent from the commencement.

The first signs of the outbreak of the disease are observed in from thirty to forty hours after infection; usually, however, on the second or third day after delivery, whilst in cases in which infection has taken place earlier the disease begins on the first day or even during labor itself, and in the exceptional cases where infection takes place later the first appearance of the disease may be at a much later period.

The disease is sometimes, but by no means regularly, ushered in by a very pronounced rigor. More frequently the temperature rises with, at least, a subjective sensation of cold and slight shivering; in other cases the fever begins very gradually.

Chilliness or rigor is by no means a symptom of great importance. They are often absent in the most fatal forms of puerperal fever, and, on the other hand, puerperal women so easily feel chilly, that even a very severe rigor, unaccompanied by other symptoms, need not be considered as the precursor of grave pathological changes.

Since almost all the organs of the body may be attacked in puerperal fever, the symptoms of the disease are, therefore, very variable. The following description will be limited to the symptoms peculiar to puerperal fever.

Puerperal ulcers are, as a rule, attended by only very insignificant symptoms; the most constant is a burning sensation during micturition, which, however, is also observed in non-ulcerating lacerations. Usually the inflammation extends to the connective tissue in the neighborhood of the ulcer, and in consequence of it the labia become very œdematous. Since the ulcers are frequently larger on one side than on the other, it very often happens that one labium is principally the seat of the œdematous swelling. Besides the burning pain on micturition, the discomfort arising from the œdema, and the intense pain on touch, there are no other symptoms which proceed from the ulcers. Fever almost always accompanies their occurrence, on account of the extension of the inflammatory processes to the neighboring connective tissue; but the ulcers themselves are not directly concerned in the elevation of the temperature, because the temperature often remains rather low when the ulcers are very large, and thickly covered. They heal very slowly; their covering is then thrown off, and healthy granulations appear at the base. Sometimes, even at a late period, they cause very intense pain on walking, and hemorrhage after the febrile disease has ceased for weeks; the induration also of the labia often persists in a moderate degree for a long time.

In the remarks on the physiology of the puerperal state we have already called attention to the fact that, in a recently delivered woman, the mucous membrane of the vagina, and especially that of the uterus, is the seat of changes which elsewhere are considered as constituting catarrhal inflammation. It is therefore, impossible to describe the symptoms of a simple catarrhal endometritis. Usually fever, scanty secretion, and disagreeable odor of the lochia are mentioned as such. From the fever alone we cannot diagnose an endometritis, and the fever itself, if it at all reaches a considerable degree, is in its turn the cause of a scanty secretion, and, consequently, also the cause of the scanty discharge of the lochia. The disagreeable odor is due to the decomposition of the retained shreds of the decidua; but such decomposition may also take place in women in whom the puerperal state is completely within physiological limits.

The commencement, therefore, of an inflammation of the endometrium has no reliable symptoms, whilst the more intense and especially the ichorous inflammation, cannot escape detection. Here the discharge is of a brownish color, as a rule, thick; sometimes quite serous, and also intensely ichorous and fetid.

The other symptoms due to such changes in the lining membrane of the uterus cannot be accurately followed, because the symptoms of septicæmic and ichorrhæmic infection of the whole organism, as a rule, greatly preponderate.

The symptoms which accompany the acute inflammatory œdema of the pelvic connective tissue are of great importance. The pain which regularly accompanies such swelling shows that the serous covering is implicated in the inflammation, and so far parametritis and perimetritis cannot clinically be distinguished from each other. We, therefore, prefer to describe under parametritis those cases in which the pain is absolutely or relatively inconsiderable in proportion to the extra-peritoneal exudation. Under perimetritis and pelvic peritonitis all those cases will be described in which the symptoms of a partial peritonitis are most marked.

Parametritis is usually accompanied by fever, the degree of which is very variable. It often begins with, but sometimes without, a rigor, most frequently on the second day, and reaches its height either at once on the first day, or at least on the day following the commencement of the disease. The fever is never a purely continuous one, but always shows remissions—as a rule very considerable ones;—very frequently even complete intermissions may occur. Exceptionally, the temperature may remain low; in two cases of very distinct exudation we could not discover an abnormal elevation of temperature, although regular observations were taken morning and evening. But, as a rule, it is very high, and may reach the highest degree with which life is at all compatible. Generally the elevation of temperature corresponds to the extent of the exudation, so that with a considerable tumor we have a high and continuous fever. Sometimes the temperature completely falls, and rises again after a short time with a new and a greater exudation. Almost all the cases, in which at the latter period of the puerperal state considerable fever with pains in the abdomen and exudation are observed, have been preceded by a slight parametritis, which, tending to recovery, became more severe through a fresh external injury.

The pulse is usually frequent, corresponding to the temperature; but some cases are distinguished by a very frequent pulse and only a slight elevation of temperature. These cases are always suspicious, because they are easily followed by ichorrhæmic and septicæmic affections. With the beginning of the fever the subjective symptoms also appear, and besides the initial and not infrequently repeated rigors there are heat, thirst, and headache.

Pain is the most important of all the subjective symptoms. It is certainly not caused by the parametritis itself, but is always due to the simultaneous irritation of the peritoneum. The latter lying close above the connective tissue, spontaneous pains are rarely absent, whilst tenderness on pressure is always observed. This is limited to the sides of the uterus, either to one or both of them, and at the commencement of the disease it often changes its place, so that it is found sometimes to the left, sometimes more to the right.

In the progress of the disease swellings form in some places, and most readily between the folds of the broad ligaments. These latter are of the greatest importance, because in combined external and internal examination they are easily accessible to the examining finger, and from the infiltration of that region the affection of the pelvic connective tissue can easily be diagnosed. It may sometimes

be found that at the side of the uterus only an increased resistance and swelling exists, so that, without there being a circumscribed and limited tumor, the finger cannot be brought so closely to the uterus as is usually the case, but a sensation is obtained as if a thick layer was situated at the side of the uterus and between the fingers. Of course, the infiltration is limited by the superior margin of the broad ligaments, so that this can be distinctly felt if the thickening extends so far. Sometimes, however, the diffused exudation is situated only in the region of the internal os, and extends thence backwards, so that the sides of the fundus uteri are completely free. The exudation can be most distinctly felt if it has originally been circumscribed, or if at a later period the general serous infiltration has decreased, so that only a thick exudation has remained between the layers of the broad ligament. Then a thick tumor is found by the side of the uterus with a broad base, so that only from its abnormal shape, and from the considerable hardness at a later period, the exudation can be distinguished from the uterus itself. But more frequently a distinct furrow is felt between the uterus and the tumor. Such tumors are not infrequently found on both sides, although, as a rule, the tumor on one side is larger than that on the other. Sometimes, also, one side is entirely free, or is only the seat of a diffused infiltration, whilst at the other side a circumscribed tumor is felt. These tumors are, however, as a rule so high up that they cannot be felt by an examination per vaginam. This explains also why for so long a time they have been overlooked, or at least their frequency of occurrence has been underrated. Sometimes they extend so far downward that they project from the side of the uterus into the vagina, like hard thick semicircular tumors. Under certain conditions they may become very large—almost the size of a child's head, but commonly they are as small as a hen's egg. Their shape is often irregular, and this may sometimes be due to the ovary, which lies close to or within the tumor. The extent of the exudation is rarely so considerable that it fills up the whole pelvic inlet and encases the uterus so completely that its body cannot be felt separately. In very rare instances the tumor is situate on the anterior or the posterior wall of the uterus.

Somewhat more frequently the infiltration extends from the side of the uterus to the iliac fossa. In such cases the combined examination shows either no tumor at all at the side of the uterus, or only a thin diffused swelling; whilst, by external palpation alone, a tumor can be distinguished situated in the iliac fossa. It, as a rule, gives rise to very decided symptoms by pressure upon the nerves of the lower extremity. Whilst in the tumors resulting from parametritis, lameness or neuralgia is rarely produced, this frequently occurs when the tumor is situated more externally. The infiltration may also extend to the nerve itself. After these tumors have persisted for some time, the contents become gradually more and more inspissated, and in the course of some weeks or months they are completely reabsorbed without leaving any trace of their previous existence. As soon as the inflammatory state and the tenderness have somewhat abated, the tumor begins to contract and becomes somewhat smaller, thicker and harder, and its circumference is able to be distinctly defined. Under favorable conditions it then rapidly becomes smaller. The reabsorption of the exudation takes place with the symptoms of distinct hectic fever, which is especially marked when the tumor is large; the patient begins to feel pretty well, the appetite returns, but the temperature, normal and occasionally also abnormally low in the morning, rises towards the evening without previous shivering to a considerable degree, sometimes up to 40° C., or even more. The tumor diminishes considerably during the fever, so that finally only a slight resistance remains. The uterus is drawn towards that side and fixed there, but the adhesion disappears at a later period, the uterus again returns to its normal position, and no trace remains of the infiltration.

In other cases, especially where external irritations are continuously active, the absorption of the exudation does not take place. The tumor contracts somewhat, becomes hard as wood, and persists in that form.

In relatively rare instances the exudation softens and suppurates. Such a termination we have only seen once in ninety-two cases of distinctly demonstrable exudation. The tumor then gradually becomes softer, and it, together with the adjoining structures, becomes sensitive to pressure. At the same time hectic fever sets in, not, however, with morning intermissions, but simply with remissions. The patients feel ill and lose in weight. Perforations into various organs may then follow, viz., into the rectum, the vagina, the bladder, into the abdominal cavity, or into the uterus. But the abscess may pass also through the thyroid foramen beneath the gluteal muscles and open externally. Abscesses in the iliac fossa easily gravitate towards Poupart's ligament, and discharge their contents externally.

In the more intense forms of parametritis, the veins and lymphatic vessels running through the centre of the inflammation are frequently involved in it. From the clinical course it may safely be concluded, that in the milder forms it hardly ever produces thrombosis of the veins. It is still more uncertain if the lymphatics are implicated. However, thrombosis of the lymphatic vessels has not that importance which was formerly generally ascribed to it.

In rare cases the virulent inflammation of the connective tissue extends less to the connective tissue of the pelvis than to that of the thigh. The inflammation may then extend either to the subcutaneous tissue or to the connective tissue which envelops the large vascular and nervous trunks. It leads to a phlegmonous inflammation of the lower extremity which in puerperal women is known under the name of "phlegmasia alba dolens."

Very rarely the disease takes such a course that thrombosis of the femoral vein is the primary affection, and that this is followed by phlebitis and phlegmasia. As a rule, the inflammation is primary and this is followed by thrombosis of the veins and of the lymphatics. Sometimes thrombosis does not take place, and we, consequently, meet with cases which, belonging to this class of affections, are especially characterized by the absence of thrombosis. If the infection is very virulent a thrombus usually forms in the veins; but at the same time this results in ichorrhæmia, and the disintegration of the thrombus causes embolism. Phlegmasia of the lower extremity frequently commences as late as the second week after delivery, after all the signs of an affection of the pelvic cellular tissue, viz., pain in the abdomen and in the lower extremity, and lameness, caused by the pressure of the exudation upon the nerve had preceded. The swelling usually commences at the thigh and simultaneously also œdema round the ankles. The swelling becomes rapidly considerable, and the circumference of the whole extremity is greatly enlarged. The extremity is movable only with difficulty, and numbness and tearing pain are felt in it. The consistency is not soft and doughy as in simple œdema, but hard as wood. On account of the tension the skin assumes a white and livid appearance and may be elevated in vesicles. Not infrequently the inflammatory swelling of the connective tissue attacks also the adjoining skin of the abdomen, and is sometimes propagated to the other thigh. As long as the acute inflammation exists there is rather high fever which shows more or less distinct remissions. If the inflammation becomes limited, and if the exudation is gradually reabsorbed, the temperature decreases. In other cases recovery is delayed by the formation of abscesses which may continue to suppurate for a long time. Death from phlegmasia is an exception, and only takes place when the skin and the subjacent soft parts become gangrenous. It is more frequently the consequence of the accompanying ichorrhæmic process or the immediate result of phlegmonous inflammation (embolism).

It has already been mentioned that the pains, which in rare cases only are absent in parametritis, are always due to an inflammation of the peritoneum. Therefore, a slight degree of perimetritis or pelvic peritonitis is regularly connected with parametritis.

In some cases the symptoms of pelvic peritonitis are most marked. The infection reveals itself by severe pains in the abdomen, which come on either suddenly, or after the symptoms of parametritis

have existed for some time; the pain may be so great that even very patient women complain and cry out loudly. The whole lower portion of the abdomen is sensitive to pressure, and usually one corner of the uterus most so. The temperature rapidly rises with or without a rigor, and reaches 40° or 41° C. Tympanitis is always present. These sudden and severe symptoms of partial peritonitis may be easily subdued by suitable treatment. By local bleeding, the application of cold, and the use of purgatives, recovery may be rapidly effected.

In other cases the pains only slightly abate; or after they have ceased for a short time soon commence again, and the circumscribed peritonitis quickly becomes general. More frequently, however, general peritonitis sets in with less acute and severe symptoms. It has been gradually set up by the parametritis, and it appears in consequence of ichorrhæmic intoxication, just as pleurisy and arthritis.

In these cases the disease begins on the second day after delivery with a rigor or slight shivering. But rigors may be entirely absent during the whole course of the disease; in other cases rigors repeatedly recur. The rigor is soon followed by the usual symptoms of parametritis, tenderness at the sides of the uterus, and remitting fever. The pain gradually increases in intensity, and spreads over the whole abdomen. The tympanites becomes very great, so that at last the pressure of the bed-clothes can be no longer borne, and the patient continually cries out with pain. The diaphragm is pushed upward by the tympanitic intestines, which, together with the concomitant pleurisy, produces great dyspnœa. Palpation of the abdomen is unbearable. By means of gentle percussion we are frequently able to discover that exudation has taken place, which, when the patient changes her position, sometimes slowly changes its place. The diaphragm is very much pushed up, sometimes as high as the fourth or even the third rib; the area of the liver dulness is represented by only a small line. There is persistent nausea or vomiting of greenish fluids, and frequent profuse diarrhœa. Sometimes, also, but not always, in very favorable cases there is obstinate constipation.

The fever is usually continuous or slightly remittent, frequently not exceeding 40°C., whilst the pulse almost always shows special characteristics. If at the commencement of the peritonitis it was not very full and frequent, it quickly rises to 120, 140, 160, or even more, beats in a minute as the inflammation spreads. Towards the fatal end the temperature frequently falls, and the pulse becomes still more frequent, which, however, is a very bad symptom. On account of the great tympanites, respiration is almost always very frequent, forcible, and laborious. The face has an uncommonly anxious expression, the forehead is covered with clammy perspiration, the extremities are as cold as ice, and the patient becomes collapsed often within a few hours.

Important deviations from the usual symptoms of general peritonitis may be met with, so that all the symptoms enumerated, though not entirely absent, yet may be but very slightly pronounced. The most constant symptom is pain, and yet there are cases in which it is very inconsiderable. Sometimes the slight sensitiveness is due to the benumbed sensorium, although occasionally, we meet with semi-comatose patients who complain of pain. But we have also seen cases of peritonitis where a post-mortem examination has shown that the inflammation had spread over the whole peritoneum, and yet the patients, without being drowsy, have only occasionally complained of spontaneous pain, and only slight tenderness was evinced by pressure upon the uterus.

But far more frequently there are spontaneous pains in the abdomen, but they do not reach that degree of intensity which may be expected from general peritonitis. After very copious exudation the pain, previously very acute, has gradually subsided, so that a diminution of sensitiveness, the general state continuing to be bad, as well as persistent tympanites and a frequent and small pulse, by no means give a prospect of a favorable termination. Meteorismus is seldom, if ever, completely absent, but in some cases it is so little marked that it cannot be counted upon as a diagnostic sign, since puerperal women, under normal conditions, also are usually subject to meteorismus. This, however, has a greater diagnostic value, indicative of an affection of the peritoneum, if the contour of some of the intestinal coils filled with gases can be seen through the abdominal walls. In one case we have seen very distinct meteorismus arise shortly before death in a patient in whom peritonitis, with a fibrinous exudation, was already tending to recovery.

Vomiting is not altogether a constant symptom, though as a rule, it is present; it sometimes occurs rather late; and even nausea is not always observed.

By means of percussion only very considerable quantities of liquid exudation can be recognized, for a large quantity of exudation may accumulate in the small pelvis and at the sides of the vertebral column.

The fibrinous exudations which are so frequently seen coating all the abdominal organs also escape detection by percussion.

The fever, and especially the pulse, show great variations in cases of general peritonitis. The temperature, which sometimes rises to above 41° C., or even 42° C., is in other instances strikingly low, so that it only rises to 39° C., and very considerable remissions alternate with complete intermissions. Fever may often be entirely absent in a very acute case, and where there is very copious exudation. The state of the pulse is more constant. It is always small and always more frequent than would be expected from the degree of the temperature. Yet this also is not without exception, and there are cases in which the pulse always corresponds with the temperature, or where it rises in a striking way only towards the fatal end.

The majority of cases terminate in death. This often occurs even in the first week, and sometimes within thirty-six hours. Consciousness may remain perfectly intact up to the last moment, nay, towards the end the patient may feel so comfortable that, though lying pulseless, she congratulates herself on her supposed recovery. In other instances the patient suffers much from dyspnœa, and is in fearful agony towards the end. Happily, the sensorium is frequently benumbed towards the end; delirium occurs, and the patient becomes perfectly comatose, and then dies collapsed, or very frequently from a complication with pulmonary œdema.

More rarely the symptoms of acute peritonitis subside, and with them the pathological processes within the abdominal cavity. Under such conditions the diffused exudation becomes encapsuled, forming tumors, which distinctly differ from extra-peritoneal tumors. By palpation large and limited tumors are felt, situated usually at the sides of the pelvis, and sometimes reaching upwards to the umbilicus.

After prolonged palpation, cooing sounds are perceived, and in rare instances a crackling is produced, as in emphysema.

By an internal examination the fundus uteri is found to be agglutinated to the place which it occupied before the inflammation began, so that the organ having in the meantime diminished in size, the cervix is very high up, and the vaginal portion no longer exists, but the os is represented by a small opening in the upper portion of the stretched vagina. As a distinction between extra-peritoneal exudation, Douglas's pouch is found filled up by a solid, hard tumor, whilst the lateral tumors can be reached from the vagina only with great difficulty. In other cases Douglas's pouch is only slightly affected, even by a very intense peritonitis.

In some of these cases the patients do not finally escape the fatal termination, and this is caused by ichorrhæmic or embolic inflammation, by a fresh exacerbation of the peritonitis, by suppuration of the exudation and by perforations into the intestines. Recovery is not quite so rare, but even in favorable cases numerous peritoneal adhesions remain, which cause colicky pains, changes in the position of the uterus, as well as sterility due to the ovaries being encapsuled, to flexions of the uterus, or to occlusion of the Fallopian tubes. The position of the uterus is so altered by pelvic peritonitis alone, that the fundus is drawn over either to one side, forwards, or backwards, or a general peritonitis may cause the fundus to adhere at an abnormally high level, and after its re-formation it

remains elevated, the vagina being at the same time drawn out to a great extent.

General peritonitis is not often met with without ichorrhæmic complications of other organs. The symptoms, therefore, may be very varying, since through the ichorrhæmia almost all the organs may be inflamed. As has already been mentioned, ichorrhæmia and septicæmia are not specifically different, and, as a rule, replace one another, so that their clinical aspects cannot be separately given; yet the extremes of series of cases of prolonged ichorrhæmia and of acute septicæmia are considerably different. The fever of ichorrhæmia has the greatest similarity to that of severe parametritis. The unusually high fever and the frequency of the pulse are decidedly of an ichorrhæmic nature; although in most cases in which recovery takes place, and in which affections of more distant organs cannot be demonstrated, a diagnosis of ichorrhæmia cannot be made. The fever regularly begins with a rigor, or at least with a subjective sensation of cold, and these rigors repeatedly recur.

The type of the fever is quite irregular. The temperature varies and often rises in a few hours some degrees. In the more intense cases the patients feel very unwell; sometimes they moan loudly without complaining of pain in any particular organ, and are conscious that death is approaching.

Icterus and profuse hemorrhage from the genitals not infrequently occur. These are soon followed by symptoms showing that various organs are affected; cough and pain in the chest show the affection of the lung and of the pleura; there is rarely bloody expectoration. The implication of the kidneys is shown by the presence of albumen, pus, and blood in the urine. There are also pains and swellings of the joints, inflammation of the connective tissue, abscesses in the muscles, and sometimes, though rather late, suppuration of lymphatic glands. The disease either tends to recovery with a gradual abatement of the symptoms, or death more frequently takes place with increasing frequency of the pulse, and sometimes with a very low temperature.

Cases of very acute septicæmia may also commence with a rigor. The temperature does not usually rise very considerably (to about 40° C.), but remains at that height, or at least only slightly remits, whilst the pulse and the respiration are very frequent, and death may rapidly occur in two or three days. The most marked symptoms are fetid diarrhœa, increasing frequency of the pulse and of the respiration, a low temperature, and a typhoid condition. In many other cases the disease passes unobserved into ichorrhæmia. The process, which had at first been considered as decidedly septicæmic, now becomes ichorrhæmic if its course be not very acute, as soon as there are affections of an organ, for instance, of the lungs or of the joints.

The previous description refers to the general aspect of the more intense forms which puerperal fever assumes. According to the localization of the disease in individual organs, the symptoms also will greatly vary. It would lead us too far were we to give all the details of the symptoms produced by the inflammatory processes during a puerperal fever. We, therefore, omit the description of the symptoms caused by individual ichorrhæmic or embolic centres, and we shall only point out important peculiarities whilst speaking of the diagnosis and prognosis.

D.—*Diagnosis of Puerperal Fever.*

It is of great importance, both as regards the prognosis as well as the prevention, that we should be able to decide whether a disease of a puerperal woman be puerperal fever, *i. e.*, whether it be due to infection or not. If the symptoms of ichorrhæmia or septicæmia be very decided a decision is, of course, easily arrived at, but this may be more difficult in the case of general peritonitis. But here the mistake can be avoided if in all cases in which the processes during labor do not sufficiently explain the occurrence of the peritonitis, we consider it of septic origin.

With regard to parametritis we have already given our opinion. Of course, we cannot deny the possibility that parametritis may arise independently of infection, but we consider such an occurrence as rare as malignant embolism apart from infection. From the reasons above mentioned, we consider the parametritis a proper criterion that infection has taken place.

The discharge of fetid decomposed lochia is not, and cannot be, considered a proof that infection has taken place. We have often had the opportunity of observing that within a few days after delivery large quantities of foul-smelling lochia have been discharged without there being any trace of disease. Decomposition of the lochia almost always takes place when large shreds of the decidua, partly separated from their connection with the surface of the uterus, have remained behind in the uterine cavity. A considerable accumulation of the secretions is usually due to great anteflexion of the uterus, by which the internal os is displaced. Auto-infection does not follow in such cases because there is no solution of continuity of the external integuments. The denuded mucous membrane of the uterus does not absorb, and the lacerations of the mucous membrane during labor have either healed or are now protected by granulations. Yet even healthy puerperal women whose lochia are decomposed require our careful attention on account of the epidemic to which they may give rise. At a later period the women may infect themselves if a mucous membrane has, subsequently, been injured, or other puerperal women with recent lacerations may be infected by the decomposed lochia of the former.

It may be difficult to decide whether acute inflammations of the more remote organs are to be considered of an ichorrhæmic origin or not. Purulent inflammations of the joints are probably always due to ichorrhæmia, and only exceptionally at the commencement of the infection, the distinction between it and an acute articular rheumatism may offer some difficulty. But it is much more difficult to decide upon the nature of a pneumonia or pleurisy arising in the course of the puerperal state. If parametritis exists at the time it will greatly aid the diagnosis, and we shall rarely make a mistake if we consider the affection of the respiratory organs as ichorrhæmic. The nature of the pneumonia is especially marked if it deviates from the usual type, if it does not attack an entire lobe, if there are no characteristic sputa and if the fever is markedly remittent.

It is of less value as regards the prognosis and treatment, though it is a subject of great interest to the accoucheur, to ascertain whether the disease has arisen from auto-infection or from without. We frankly declare that we do not believe in the prevalent notion of frequent self-infection as asserted by several authors.

It cannot be denied that at times, when lying-in institutions are free from epidemic diseases, even very considerable injuries, as well as the retention of the membranes and of the placenta, are not attended by unfavorable results. In the absence of an epidemic there is hardly a pronounced case of ichorrhæmia or septicæmia, which we could easily attribute to self-infection, whilst acute peritonitis, which often follows severe injuries, cannot be considered as belonging to puerperal fever. The isolated cases of puerperal fever, especially in private practice, show that self-infection is not very frequent; and in lying-in hospitals also in which the material is relatively little used for teaching, a long time may pass before a case of puerperal fever occurs, whilst an exhaustive use of the material for study and the frequent examinations of puerperal women as practised especially in maternities connected with medical schools, soon lead to a deterioration of the sanitary condition. It is easily understood why the accoucheur prefers self-infection to infection by means of the examining finger.

It is also of importance to know whether after infection has taken place the process is still localized or whether it has already extended over the whole organism.

It may be concluded that the process has extended only by continuity of the tissues as long as the general symptoms, especially the temperature, the pulse, the respiration, and the cerebral functions, correspond to the local inflammation, and that inflammatory changes in organs distant from the place of infection cannot be recognized.

But if any slight local inflammation, or a slightly painful parametritis with an inconsiderable exudation, is attended by cerebral disturbance, if the fever is very high, and if especially the temperature does not correspond with the pulse, so that with a temperature of 39·5 the pulse beats 160 in the minute, the fever has already assumed an ichorrhæmic character.

For the diagnosis of the different local diseases everything depends upon an accurate examination performed according to the rules of gynæcology, medicine, and surgery.

We shall only point out the more important facts.

A slight degree of parametritis cannot be recognized without an accurate combined internal and external examination, because in no other way are we able to detect a small infiltration at the side of the uterus.

Partial and general peritonitis, as a rule, arrest the attention by the severe pain which the inflamed peritoneum gives rise to, and thereby, as well as by the great tenderness on pressure, the meteorismus, the vomiting, and the presence of free exudation, they are easily recognizable. Yet all these symptoms, even in acute diffuse peritonitis, may be very little pronounced, and in such cases the diagnosis may be attended with very great difficulty. We do not even hesitate to state, that a great many cases which, on account of the paucity of the symptoms, have been considered as pelvic peritonitis, and have ended in recovery, were actually cases of general peritonitis. We base this assertion on some cases we have observed, where, in spite of the slight symptoms, death occurred in consequence of the inflammation; the autopsy showed that the inflammation had extended over the whole peritoneum; and in one case especially, where a year after delivery the patient died of tuberculosis, the remains of general adhesive peritonitis were found on post-mortem examination, whilst during the puerperal state the disease only appeared to be a slight perimetritis occurring in a debilitated subject. For the diagnosis of such cases of general peritonitis with very indefinite symptoms, we attach much value to the general state and the condition of the pulse, which always give an unfavorable impression. Of the distinction between intra- and extra-peritoneal exudation, we have already spoken above.

Pleurisy comes on with pain, and is recognized by its physical signs, especially by a friction murmur and the presence of an exudation. The diagnosis of lobular pneumonia is much more difficult, because almost always the characteristic sputa are absent, and there is either no dullness whatever on percussion, or it is only very slight. But the inflamed portion can be distinguished by the small vesicular crackling, whilst the smaller centres depending upon embolism usually escape detection.

The diagnosis of meningitis must be made with caution. Whilst cerebral symptoms are very frequent in puerperal women, inflammation of the meninges is so rare that there must be paralysis before a diagnosis can be made.

It is more easy to recognize inflammation of the joints. The restricted movements and the often very acute pain in the attacked joints are highly characteristic. But the pain may be slight, or even completely absent, if the sensorium is benumbed. There are occasionally very severe pains in some of the joints, and on post-mortem examination we fail to detect any pathological changes. Swellings round the joint are not always due to the presence of pus, but if the capsule of the joint be swollen the tumor always contains pus.

Inflammation of the endocardium can rarely be diagnosed with absolute certainty during life, since functional disturbances of the heart are very frequent, and in many cases the post-mortem examination shows no anatomical changes in the endocardium. Slight degrees of enlargement of the spleen are found in almost all puerperal diseases of a more serious character; but whether the enlargement is due to hyperæmia or to infarctions or abscesses cannot as a rule be decided. We must not omit, however, to state, that in one case, with a very high and rapidly intermittent fever and unusually frequent rigors, we found an abscess of the spleen. When there is peritonitis it is impossible to define an enlargement of the spleen by means of percussion.

The affections of the liver are generally overlooked. Icterus is very frequently met with, even when at the post-mortem examination the liver is found to be normal, or in the first stage of a parenchymatous inflammation. Pain in the region of the liver is rare.

Diseases of the kidneys are indicated by the state of the urine. If in previously healthy women blood, albumen, and granular casts are found in the urine, the kidneys are implicated in the puerperal disease. But we must also remember that pus and blood may be derived from the bladder. To examine the urine of puerperal women it must be drawn off by means of the catheter.

E.—*The Prognosis of Puerperal Fever.*

In all the forms of puerperal diseases due to infection a prognosis is to be made with great caution. For even the mildest form of parametritis may pass into a grave ichorrhæmic affection. If the disease remains stationary as a simple parametritis, the prognosis is decidedly favorable, for in the great majority of instances the contents of the tumor are reabsorbed. It rarely terminates in the formation of abscesses. This is more unfavorable, because the persistent suppuration causes a considerable loss of strength, and the healing of the abscess produces changes in the position of the genital organs. Affections of the peritoneum always render the prognosis doubtful, although the extension of the inflammation to the serous membrane of the pelvis may in many cases be arrested. All intra-peritoneal affections are, therefore, of practical importance because they terminate with the formation of pseudo-membrane and lead to stricture and atresia of the tubes and change of position of the organs of the true pelvis.

In inflammation of the whole peritoneum the prognosis is very unfavorable. Exceptionally only it terminates in recovery, and even in cases where the acute symptoms disappear, and the deposits of pus become encapsuled, many patients die of exhaustion, perforation, or fresh exacerbations of the peritonitis.

Of sixteen patients who had undoubtedly general peritonitis, only four lived, whilst the remaining twelve, in four of whom the inflammatory processes in the abdominal cavity had begun to subside, died.

We have already stated that, according to our conviction, many cases of general peritonitis which were supposed to be only partial pelvic peritonitis may end in recovery. When symptoms of ichorrhæmia and septicæmia appear the prognosis is very grave. In such cases the fatal end must always be expected, although happily it does not often take place. So long as the disease is not localized the prognosis is only unfavorable when the general symptoms are very grave. Inflammations of the respiratory organs are attended with great danger, yet they also may end in complete recovery. In purulent inflammation of the joints death is very frequent; in the great majority of cases it is the result of the intense ichorrhæmic affection, but sometimes also it is the consequence of the suppuration. Recovery is at times only partial, with the usual terminations of a purulent articular inflammation.

Most of the other diseases offer considerable difficulties in both diagnosis and prognosis. Embolism may be suspected, but by no means with absolute certainty, when after a rigor the temperature rises very high, and immediately afterwards falls considerably. The prognosis is always grave, but we have seen a case in which repeated and severe rigors, together with very high temperature, occurred without there being any other disease than peritonitis with exudation.

The treatment consisted in the production of very profuse diarrhœa. On the thirteenth day of the disease the fever which was

markedly remittent decreased, and in the third week of her illness the woman was discharged from the hospital cured, although the exudation had not been reabsorbed.

F.—*The Treatment of Puerperal Fever.*

Prophylactic measures ought to occupy the first place. Since infection is brought about by septic material, parturient and puerperal women must be carefully watched in order to prevent the reabsorption of decomposed organic matter. Let us therefore, first of all, consider the precautions which we must take in order to guard against self-infection. We have already given it as our opinion that self-infection is far more rare than infection from external sources. We believe that usually the bruised soft parts are encapsuled by inflammation, and are thereby rendered innocuous to the whole organism. We further believe that, as a rule, retained pieces of the ovum only then acquire infective properties when the place at which infection is possible is no longer capable of absorbing. Accordingly we consider that self-infection occurs chiefly in those cases in which septic material has formed before delivery is completed and has passed through the vagina. This is especially the case where the dead fœtus decomposes under the influence of the atmospheric air, or where neoplasms of the maternal organs disintegrate during labor. Pressure bruising the soft parts then only favors infection when delivery takes place after the soft parts have already become gangrenous, so that the gangrenous secretion passes over the recent lacerations of the mucous membrane.

The danger of infection therefore depends less upon the tedious labor attended by great pressure upon the soft parts, but rather upon a tedious and prolonged labor. It is therefore the duty of the accoucheur to shorten the labor. This is not the place to detail in what way this can be done. We will only remark that it is highly important to terminate labor in every case before putrid discharges appear. In all such cases, then, and also when after perforation or embryotomy the parts of the dead fœtal body come in contact with the genital canal, we should immediately after the expulsion of the ovum wash the parts by means of very careful injections with dilute carbolic acid in order to disinfect the small lacerations of the mucous membrane.

Again, when the lochia are decomposed, the accoucheur himself may produce a condition favorable to auto-infection. This is done by destroying with the examining finger the still recently produced mucous membrane lining the uterus, or the granulating wound at the vaginal outlet. In this way a solution of continuity is produced. The septic matter of the lochia is then easily absorbed.

Our chief aim, therefore, should be to prevent decomposed organic matter being brought to the puerperal women. Such septic substances are brought to the genitals of the recently delivered women principally in three different ways. First, by sheets, sponges, etc.; secondly, by the hand or instruments of the accoucheur; and, thirdly, by the hand or instruments of the midwife.

The difficulty with regard to the first point is easily avoided in private practice. Everything that is brought in contact with puerperal women should be very clean, and this is most necessary during the first days after labor. As soon as that period is past the anatomical conditions are, as a rule, unfavorable for infection.

Often enough we have seen quite healthy puerperal women lying on sheets soiled with the discharge; it is evident that scrupulous cleanliness in this respect is necessary.

Secondly. The hands of the accoucheur and his instruments must be absolutely clean, lest the hand which ought only to help, and not harm, should bring disease or death.

Though it is easy to state this, yet it is extremely difficult to carry out fully. It is, of course, well understood that every accoucheur, before examining a woman, should thoroughly well wash his hands; but this alone is not sufficient. Let the accoucheur accustom himself, each time before examining a woman, during or immediately after labor, to think of everything which he has handled in his avocation during the last few days. Washing simply with soap and water is only sufficient if the practitioner knows with certainty that latterly he has not come in contact with decomposed organic matter. We are, of course, not able to mention all the modifications under which septic matter may prove the source of infection. We shall mention only some of the most frequent. The accoucheur must consider his hands not quite free from poison if he has handled any portion of a dead body, if he has seen a patient suffering from phlegmonous erysipelas or any kind of pyæmia, if he has dressed suppurating or diphtheritic wounds, if he has come in contact with decomposing new growths, if, in a case of abortion, he has extracted a decomposed ovum or portions of it, if he has examined women with badly smelling lochia, or suffering from puerperal fever. He must then clean his hands most scrupulously before he undertakes the examination of a parturient or puerperal woman.

Now, simple cleansing with soap and water is not sufficient; he should use a nailbrush or rough cloth, so as to remove the superficial layers of the epidermis. It is also desirable to add disinfecting fluid to the water. We recommend for that purpose chlorinated water, permanganate of potash, concentrated acids, and especially carbolic acid, which we consider the best disinfecting agent.

The instruments should be cleaned with the same precautions. This is best done by means of boiling water, and although this does not destroy, according to Bergmann, the efficacy of the sepsin, it, nevertheless, dissolves the septic material, and most certainly washes it off the instruments. If the accoucheur has for some time been in contact with septic matter it is urgently necessary that he should change his linen and his coat. If, for instance, he had examined, in the usual way, a puerperal woman suffering from puerperal fever, he can never be sure that infecting matter does not adhere to the sleeve of his coat which was brought under the bedclothes.

If the accoucheur takes all these precautions he will not be forced to give up his obstetric practice for a time, if puerperal fever happens to occur.

The third agent which may be the means of bringing infection is the nurse. She requires very careful supervision. She is not acquainted with the danger of the manual transfer of septic matter, and though her attention be called to it, she is only able imperfectly to appreciate the character of the danger. It is, therefore, urgently necessary not to admit nurses or midwives who have attended a diseased puerperal woman to a fresh case of labor.

It is our firm conviction that in this way only the transfer of the disease can be effectually prevented. The proposal which we make may, in the mean time, be received with difficulty by the public, and especially by nurses; but that opposition will soon subside, since the time is not far distant when the bulk of the public will be acquainted with the danger which menaces them through incautious accoucheurs and midwives.

The most careful attention to the prophylactic measures, therefore, is of the greatest importance, for only thus are we able to prevent an outbreak of puerperal fever, and if the disease has once appeared in a puerperal woman there is little prospect of staying its course, although the treatment is by no means so powerless as has been assumed by some.

We do not know any specific remedy with which we are able to neutralize the action of the septic matter in the tissues and in the blood. Polli has lately recommended the sulphites for this purpose. Bernatzik and G. Braun have administered them in some cases, and have found them inefficacious. But we think that their opinion is too unfavorable. We have used the sulphites of soda and potash (about 4 gram. a day) as well as sulphurous acid (2 gram. to 1 lb. of sugar-water per diem). They produced profuse diarrhœa and had a very favorable effect, although we had soon to discontinue them on account of the diarrhœa. We urgently recommend further trials of those preparations. From experiments on rabbits, Hüter and Tommasi recommend carbonate of soda and permanganate of potash. Tyler Smith has seen a desperate case

recover after the injection of liquor ammoniæ and water (1 to 3) into the veins.

In the last century purgatives were used in the treatment of puerperal diseases, and recently they have again been strongly recommended by de Latour, Seyfert, and Breslau.

A priori there is a good deal in their favor. If we may expect to remove the absorbed septic material from the blood, there can be no doubt that the best way is through the intestinal canal. Observation also has taught us, that dogs poisoned by septic matter recover after profuse and fetid diarrhœa. The recommendation, therefore, to produce artificially diarrhœa rests on actual observation. In fact, we are inclined to think that we have obtained decidedly favorable results from purgatives, and we therefore strongly recommend them in mild cases.

A decrease of temperature is most commonly seen after their use; the affection of the peritoneum becomes much less painful, and the general symptoms are less troublesome. We have never seen any bad effects resulting from copious diarrhœa; even if it be very profuse the strength does not decline more than may be expected independently of them. This, however, does not mean that we recommend the use of purgatives in every case of puerperal disease without distinction. It appears that some epidemics are distinguished by copious diarrhœa, and we readily admit that the diarrhœa may be so great that it would be more than audacity to increase it still further. In the milder affections we give castor oil, which does not irritate the intestines, and in the graver ones we prescribe the preparations of senna (which, however, cause slight griping) or calomel.

As a last and desperate measure to substitute healthy for the poisoned blood, transfusion may be recommended, which Hüter has performed with at least a transient good result.

All the attention of the accoucheur must be directed to the fever, especially if it assumes the continuous type. A long continuation of high temperature brings the system into the greatest danger on account of the consumption of the tissues. We possess a very valuable remedy against this danger in the methodical application of cold water.

The indication for it cannot be determined by the degree of the temperature alone. The temperature may transiently reach 40° C. or 41° C. or even more, and may so rapidly sink again that a fever which has once reached 41° C. by no means necessarily indicates the application of cold water. But matters are different if the temperature continually remains at such a height or only slightly remits, when cerebral symptoms occur, and when the strength urgently requires to be supported.

The water is most suitably applied in the form of the cold or gradually cooled bath. It is also very useful to wrap the patient in cold wet sheets, which may be especially recommended where the circumstances, under which the patient lives, render the use of cold baths impossible.

The best mode of applying the wet sheets is as follows:—Two beds, each containing a cold wet sheet, are placed side by side. The patient is to be wrapped up in one of these sheets, and after the lapse of a few moments she is taken from this bed to the other, and again wrapped in the same way in the second wet sheet; she must then be again brought into the first bed and wrapped in the first sheet. This procedure is to be repeated from twelve to twenty-four times or more successively; since the above-mentioned method gives great trouble, it suffices, in mild cases, to apply the cold water only to one side of the trunk. For that purpose large sheets are folded so as to be about the size of the trunk; they are then dipped into cold water and placed over the anterior surface of the patient's trunk, and repeatedly replaced by fresh ones. The result of the treatment is generally very evident, but variable in character. If before the application of the water the temperature had reached its greatest height, or if it had already begun to fall, a considerable decrease, down to the normal temperature, or even lower, can be obtained with certainty. But if the temperature was rapidly rising the result is, as a rule, only transient, for the elevation, interrupted for a short time, is soon afterwards continued, and not infrequently with a rigor, but in such cases also a favorable influence on the course of the temperature (especially after repeated applications) cannot be denied. On the following days the fever does not rise to so high a degree, and it becomes more remittent or intermittent. The frequency of the pulse also quite suddenly diminishes after one application of the cold water.

The most beneficial result of the reduction of the temperature consists in the improvement in the general state. Patients with previously quite benumbed sensorium become conscious again for the first time in many days, and by the energetic use of cold water they are enabled to give indubitable signs of the comfort which they derive.

In other cases, when the sensorium is not affected, the subjective state evidently ameliorates, the intense headache diminishes, the tormenting thirst decreases, and the excruciating anxiety and depression under which the patient suffered give way to sensations of general well-feeling.

Other remedies recommended for the reduction of the fever are much less certain. From quinine, which we have given in doses of one and two grammes, we could not see any constant effect. Barker, Elliot, and v. Grünewaldt recommend veratrine. The very great frequency of the pulse indicates the use of digitalis.

The local diseases also must be carefully attended to. The puerperal lacerations must be suitably dressed with carbolic acid. If this is used early the further extension of the laceration is prevented, and the healing process is greatly favored. There is no necessity to resort to the very painful operation of touching the wounds with solid nitrate of silver. In putrid endometritis injections are to be repeatedly made for the purpose of cleansing and disinfecting; but these, as well as the local treatment of puerperal fever, require every precaution, in order to prevent the transfer of the disease. The ordinary parametritis almost always terminates favorably without complications; it, therefore, does not require active treatment. Moist heat, in the shape of the so-called Priessnitz's embrocation, acts on the local bruises, mitigating and diminishing the pain with great certainty. The exudation, which is often very great, demands special attention. Under favorable conditions, consisting chiefly in maintaining a quiet posture in bed, or at least on the bed, it is quickly and completely reabsorbed. This may be favored by warm hip-baths, with or without alkalies, and very efficaciously also by iodide of potassium (ten grains dissolved in sixty of water, twenty drops twice daily). Under its continuous use very extensive and hard tumors rapidly diminish in size and disappear almost completely, whilst the general state and the nutrition improve.

The dangers of parametritis, viz., the extension of the inflammation to the peritoneum or the complication with ichorrhæmia, are most certainly obviated by the earliest possible use of laxatives. On the first appearance of pain we give a few tablespoonfuls of castor oil at short intervals, until they are followed by a few thin stools; if, as rarely happens, the oil does not act, watery stools are obtained by the use of salines or the preparations of senna.

If the intense pain indicates the appearance of partial peritonitis, the treatment must be energetic, in order to prevent the spread of the inflammation to the whole of the peritoneum. In such cases we give immediately five grains of calomel, and continue every two hours with two grains until very copious diarrhœa follows or the gums are affected. At the same time we apply at least twelve leeches to the painful spot, and allow the leech-bites to bleed sufficiently. Olshausen recommends the application to the vaginal portion of from two to four leeches, which bite easily, in spite of the lochia. To prevent the animals from creeping into the uterus a few pieces of cotton wool may be put into the cervix. After the bleeding we place ice-bags on the painful parts of the abdomen. In almost all cases the previously insupportable pains are mitigated by this treatment, and, as a rule, the danger is entirely removed by it. In either case the pains may return, and a renewed application of the leeches and ice may become necessary.

If general peritonitis has occurred the condition is decidedly grave in the highest degree, but not entirely hopeless. If there is no diarrhœa this must be produced as early as possible by means of calomel. The application of ice to the abdomen ought to be continued and the vomiting stopped by pieces of ice or champagne. The more intense pains require subcutaneous injections of morphia. Turpentine enemata render the greatest service against the distressing meteorismus. Tarnoffsky and Dohrn saw very good results from painting the anterior abdominal wall with collodion, whilst other observers have not been successful with it.

A future time will have to decide to what extent the removal of the fluid exudation by puncture will find a place in the treatment of general peritonitis. Spencer Wells removed the fluid which accumulated in Douglas's pouch after ovariotomy by means of the trocar, and made use subsequently of drainage tubes. Thompson and Storer have even washed out the abdominal cavity with greatly diluted carbolic acid. In all cases in which a retro-uterine tumor is attended by grave symptoms of peritonitis, or by those of blood-poisoning, Douglas's pouch may be punctured through the vagina, and the exudation thus removed.

Puncture through the abdominal walls must remain limited to extreme cases, in which the exudation is evidently very considerable and Douglas's pouch not very prominent.

When collapse comes on the fatal end may sometimes be prevented by the copious use of strong wine. We have seen four cases in which with such treatment death did not occur at least at the height of the peritonitis, but only after it had begun to subside, and in four other cases the patients recovered. In one case the patient was already moribund and comatose, but by the free use of wine she was kept alive until she finally and completely recovered.

On the whole, good food and an abundant supply of wine should be given, even when the fever is considerable.

Of the treatment of metastatic inflammations we cannot speak in detail. This must be varied according to the principles of medicine and surgery.

Appendix.—Tetanus Puerperalis.

Happily it is only in very rare cases (at least, in Europe) that tetanus occurs after labor at term; it occurs, however, somewhat more frequently after premature deliveries. Its etiology is still quite obscure. We mention it in the Appendix to Infectious Diseases because it is very probably due to infection, or at least to a peculiar irritation proceeding from a puerperal wound.

The causes also which favor the occurrence of tetanus are not yet distinctly known, and the influence of cold is the most uncertain of all of them; relatively speaking, tetanus occurs more frequently after profuse hemorrhage, especially if this has rendered plugging of the vagina necessary. The symptoms do not differ from those which are found in tetanus following any other injury.

The prognosis is very unfavorable. Of twenty-seven cases collated by Simpson, five only terminated in recovery. The treatment, therefore, can show very little success. In accordance with the views of Simpson, we recommend the use of chloroform so as to produce absolute anæsthesia.

CHAPTER XXIII.

DISEASES NOT DUE TO INFECTION.—*SCHROEDER.*

A.—Febrile Diseases apart from Inflammation of the Genital Organs.

Puerperal women are, of course, liable to the various febrile diseases which only form an accidental complication of the puerperal state.

Those diseases do not generally offer any special characteristics. The diagnosis may be difficult when the symptoms are closely allied to those of grave puerperal processes. It may, therefore, be very difficult to distinguish a severe typhoid fever from puerperal infection of a septic character. The explanation also of the inflammations of many organs, especially that of the lungs, may be difficult, inasmuch as they occur, either as accidental complications of the puerperal state or as ichorrhæmic inflammations of puerperal fever. The latter, however, are distinguished by the absence of the typical course characteristic of the former. A similar mistake has frequently occurred between true scarlatina and a scarlatina-like exanthem, which often occurs in puerperal fever.

Although there can be little doubt that occasionally puerperal women are affected by the real contagion, and suffer from true scarlatina, yet they are by no means especially predisposed to infection by that poison, and the large majority of grave diseases termed puerperal scarlatina, with an erythematous dermatitis extending over the surface, is nothing but puerperal fever with such a cutaneous affection.

There are also other causes which, independently of infection or local inflammation of the genitals, very frequently produce fever in puerperal women. These are, first of all, very great distension of the intestine with fecal matter. We have already stated that, during pregnancy, the action of the intestines is so sluggish that not infrequently enormous quantities of fæcal matter accumulate, and that before or during labor only a very small part is evacuated. The pregnant woman quite commonly enters the puerperal state with a greatly distended intestinal canal, and within the first few days after her delivery the bowels continue to be sluggish.

The retained feces may produce very decided symptoms of intestinal irritation. In the milder cases there is fulness and swelling of the intestine, with slight inflammatory irritation of the mucous membrane; but certainly, in rare instances, the irritation is continued to the serous coat, and it may assume the proportions of peritoneal irritation, and even that of acute peritonitis.

The abdomen, already somewhat swollen and hard, swells still more. A circumscribed, or more frequently a more diffused, tenderness, which may reach a very high degree, is observed (chiefly in the cæcal region), and prolonged and even persistent vomiting may follow.

The due evacuation of the intestine causes a rapid subsidence of all the symptoms. The diagnosis must rest chiefly upon feeling the fecal masses. A greatly distended rectum has less value, but more so the distension of Douglas's pouch with a very distended intestinal coil, which can be felt through the posterior wall of the vagina; but the uniform distension of the whole intestinal canal is most distinctly observable by means of palpation of the abdomen, for although in normal puerperal women the abdomen is quite commonly somewhat distended, yet it is soft and easily compressed; but by the retention of large masses of feces it becomes hard, as a rule uniformly unyielding, so that the uterus can be felt only with difficulty, even in the first days of the puerperal state. In other cases diffused swellings are felt. If also, by a combined examination, the sides of the uterus are found to be free from pain, and if there is tenderness, especially in the cæcal region, we have not to do with peritonitis in consequence of infection, but intestinal irritation through koprostasis. And in spite of the woman's assertion that the bowels have been opened regularly, that diagnosis must be persisted in, for it sometimes (and not rarely) occurs that, in spite

of daily evacuations, the intestine is enormously distended. The line of treatment to be adopted is evident.

It is advisable to pay attention to the intestinal functions in all puerperal women immediately after delivery, and especially in cases in which the bowels appear to be greatly overfilled. Aperient medicines ought to be given on the first or at the least on the second day after delivery. They are, as a rule, always indicated when the woman has had no stool until about the fourth day. Castor oil is the mildest aperient, it irritates the bowels the least, and yet causes with great certainty a free evacuation. In rare instances only, repeated doses of it do not act, and preparations of senna or rhubarb or calomel should then be administered. If castor oil is refused on account of its nauseous taste salines may be given, which, of course, usually produce watery stools. But diarrhœa need not particularly be feared in the puerperal state. Often very large quantities of feces are evacuated by means of purgatives, but Poppel relates a case of koprostasis which was relieved in the course of four days by forty-four very copious stools.

Profuse hemorrhage is another frequent cause of the elevation of the temperature of puerperal women. There is pretty constantly increased frequency of pulse, lasting for a long time. The temperature, as a rule, rises up to 39° C. (102·2° F.), and remains, with less regular morning remissions, between 38° C. and 39° C.

B.—CHANGE OF POSITION OF THE UTERUS AND VAGINA.

1. *Flexions and Versions of the Uterus.*—We have already mentioned in the chapter on the physiology of the puerperal state that an empty uterus is pushed forwards by the pressure of the abdominal muscles acting on its posterior surface, so that it falls upon the symphysis, and that it remains in that position during the first few days of the puerperal state unless other causes (most frequently a distended bladder) press it backwards.

In the first days after delivery the cervix hangs down in the vagina like a loose sail. On the next day or two it is so far formed that its direction can be determined in relation to the axis of the uterus. The cervix is again distinguishable, as a rule, and forms an obtuse, sometimes a right, but often also an acute angle with the axis of the uterus. According to this variation anteflexion is more or less distinctly pronounced. It is most so when the body of the uterus is strongly inclined forwards, and the cervix is directed from behind and above forwards and downwards. The flexion may then become so considerable that the anterior wall of the uterus and that of the cervix almost touch each other. It is rare for the direction of the cervix to be so much inclined backwards that there is, whilst the body of the uterus is bent forwards, exclusively an anteversion, and not also a flexion.

The uterus is usually found directed forwards in the first few days of the puerperal state; it is rarely found inclined backwards. This can be easily explained. In the first few days of the puerperal state the uterus is still too large to fall down beneath the promontory, and in the usual posture the pressure of the intestine is directed upon the posterior wall of the still greatly enlarged organ.

The altered position of the uterus does not give rise to any special symptoms in the early days of the puerperal state. Women with either anteflexion or retroflexion do not complain of it as long as they remain quietly in bed, but we have found in some puerperal women with anteflexion that the discharge of the lochia was prevented by the flexion at the internal os, and when the fundus has been raised some ounces of a brownish fetid liquid flowed off.

But not even that has given rise to complaint. Treatment of the anteflexion is unnecessary because it always gradually disappears of itself.

Retroflexion should be attended to in cases in which the altered position had previously existed and where there is reason to fear that it will recur. We therefore keep the woman in bed for some time.

2. *Prolapsus of the Uterus and Vagina.*—During pregnancy the vagina hypertrophies so greatly that its anterior wall, as a rule, projects into the vaginal outlet, and not infrequently prolapses to a slight degree beyond it.

In the puerperal state this latter appearance is quite common. But this prolapsus gradually disappears in consequence of the changes in the vagina. The posterior wall rarely projects beyond the outlet. It most frequently occurs in pluriparæ in whom previously prolapsus of the vagina had existed, and a laceration of the perinæum had healed by granulation. If the prolapsus of the posterior vaginal wall becomes more considerable the uterus itself may be drawn downwards.

The uterus may also primarily descend in the puerperal state, or even be prolapsed. At an early period a true prolapsus scarcely ever occurs, on account of the great size of the organ; but as soon as the uterus has commenced to undergo its retrogressive formation it may prolapse suddenly under certain circumstances. This occurs most easily if the vulva is very large and if there had previously been a prolapsus. Much more frequently it occurs gradually some weeks after delivery.

The treatment of prolapsus consists in maintaining a dorsal posture in the first few days, but afterwards it is the same as in the non-puerperal state.

We may also state that the prolapsus which had previously existed, is in rare cases cured during the puerperal state; the body of the uterus is then fixed by adhesion to the pelvis, or the vagina becomes strictured in consequence of gangrene.

C.—SOLUTIONS OF CONTINUITY IN THE GENITAL ORGANS.

Lacerations of the genital organs almost exclusively occur during parturition. They have been sufficiently spoken of in the pathology of parturition. Here we shall only say a few words on the febrile disturbances which occur in consequence of these lacerations. We omit, however, the perforating ruptures, in which the symptoms of peritonitis very soon predominate.

Traumatic fever, though not regularly, yet very frequently occurs after severe lacerations of the vagina or vaginal outlet, and especially in those of the perinæum. It comes on soon after delivery, within the first few days. It very rarely begins with a rigor, more frequently with slight shivering, and, as a rule, the temperature is not much elevated; exceptionally only it reaches 40° C.

The fever is more or less remittent, exceptionally only intermittent, and at times lasts for five days. Sometimes the fever occurs somewhat later.

D.—NEW GROWTHS IN THE PUERPERAL STATE.

Fibroid tumors of the uterus are a very rare but important complication of the puerperal state. These may give rise to danger during the puerperal state in a variety of ways. By preventing the uniform contraction of the uterus they may cause profuse hemorrhage; then they undergo changes which are of great interest. The surface of the tumor may putrefy, and the putrid substance absorbed by the smaller lacerations may lead to septic infection. It appears that the acute softening of fibroids, a participation, on account of the similarity of their structure, in that retrogressive metamorphosis which the uterine parenchyma passes through, may cause considerable danger. It is probable, also, that the acute disintegration of such considerable masses of tissue and the reabsorption of the disintegrated parts may produce ichorrhæmia. If the organism is able to bear the involution of the fibroid tumor a complete recovery from the new growth may take place during the puerperal state.

On account of the dangers attending fibroid tumors it appears to be necessary in all cases where an operation can be performed, and especially if there is a fibrous polypus, to remove the new formation by means of the écraseur or the scissors.

We have already spoken of the sad prognosis which carcinoma of the cervix offers in the puerperal state, even if it be not attended by rupture of the uterus during parturition.

E.—HEMORRHAGE IN THE PUERPERAL STATE.

Hemorrhage in the puerperal state is of great practical importance. Normally the puerperal woman loses, during the first days, almost pure blood; then, for one or two days more, there is a dark reddish discharge; after this, for about the same time, she has a clear discharge, containing only a little blood; but very frequently these times are not kept.

The bleeding either lasts a longer time or it returns on slight causes, and especially when the woman first leaves her bed. Yet hemorrhage occurring after the fifth day, as long as only streaks of blood appear in the lochia or at times a small quantity of blood, is not of great importance.

But the cases are not so rare in which a profuse and dangerous hemorrhage occurs either immediately after delivery or where at a later period protracted and debilitating hemorrhage sets in. We omit here hemorrhage which has arisen from laceration either during or immediately after the expulsion of the child, because it has been already mentioned in the pathology of parturition. We shall here consider chiefly all hemorrhages from the free surface of the mucous membrane, as the blood escapes externally.

The most frequent cause of considerable hemorrhage immediately after the expulsion of the placenta is atony of the uterus. Its causes have already been pointed out, and we have only to remark that the greatly distended bladder, which presses the uterus upwards, is not a rare cause of metrorrhagia.

The treatment is first of all directed to the production of powerful uterine contractions, since by these alone can the bleeding vessels be made to close. For that purpose the fundus of the uterus should be energetically rubbed by the hand placed on the abdominal walls, and, at the same time, the uterus should be compressed in the way recommended by Credé. By the last manœuvre coagula of blood which remain in the uterus are pressed out with great certainty, and the introduction of the hand for that purpose is rendered unnecessary.

If in spite of energetic friction of the uterus no tendency to contraction is shown we may endeavor to bring it about by introducing one hand into the uterus and rubbing the uterus between the two hands.

Great irritation of the inner surface of the uterus is produced also by the injection of cold water or vinegar and water, and very suitably also by the introduction of large pieces of ice. It is, besides, also advisable, in a case of atony of the uterus, to administer immediately ergot of rye, at least thirty grains, in two doses, at a short interval.

Too much reliance is never to be placed upon that remedy, and the treatment must be continued as if no ergot had been given.

If satisfactory uterine contractions cannot be obtained in this way, we may try to stop the bleeding by compression, *i. e.*, by pressing the anterior and posterior walls of the uterus against each other. Deneux accomplishes this by pressing the uterus from the outside against the vertebral column, whilst Hamilton pressed the two surfaces of the uterus against each other with one hand applied externally and the other internally. Hubbard recommends compression of the uterus in the half-lateral position against the iliac fossa, the muscles in the lateral abdominal wall, and the column of the lumbar vertebræ. Fasbender's method is as follows:—He introduces one hand high up along the posterior wall of the vagina, and the other hand he places externally upon the anterior surface; he compresses thus both walls of the uterus.

We think that the pressure would be more practically exerted if one hand were placed against the anterior wall of the vagina whilst the other hand externally pressed the posterior surface of the uterus, and thus the uterus would be pressed against the symphysis, and also against the hand placed in the vagina. In cases in which there is no absolute want of contraction of the uterus, but where this is required only in order to prevent the escape of blood from the placental insertion, bleeding may be arrested by the injection of liquor ferri perchloridi, in order to favor the formation of thrombosis, a method of treatment which Barnes has lately recommended extensively. The liquor is to be so much diluted that the fluid to be injected should have the yellow color of wine. The proportion of four ounces to twelve ounces of water, as recommended by Barnes, is not necessary. In thus injecting into the uterus great attention must be paid to prevent the admission of any air at the same time. Wynn Williams recommends a more rapid way of applying a solution of perchloride of iron. He dips a sponge in it, introduces the sponge into the uterus, and swabs its inner surface.

If we succeed in causing contraction of the uterus, the next most important thing is to guard against its relaxation, and thus prevent the recurrence of the bleeding. For that purpose the ergot already administered is very useful, even though it is by no means to be trusted absolutely.

The further state of the uterus is best controlled by the hand applied to the abdominal walls; the uterus must be constantly watched, and as soon as it begins to be soft the hand must cause it to contract again by means of gentle friction.

Danger is only quite over when the uterus remains hard spontaneously. If it shows a tendency to relax and to bleed again, the hand must remain there to watch over it during the relaxation. If the bleeding again stops and the uterus becomes softer only from time to time, the attention to the uterus, since a contracted uterus can easily be felt through the abdominal walls, may, in case of need, be left to the nurse, or even to the puerperal woman herself. Their attention, however, must be directed simply to the fact that as soon as the hard body can no longer be felt in the belly they must rub the whole inferior region of the abdomen until the circumscribed hard body of the contracted uterus is again felt. We prefer to keep up the pressure by the hand to the employment of a sand bag or a thick book.

It will be readily understood that the momentary as well as the lasting consequences of the bleeding must be obviated in a suitable way. Consequently, in order to avoid syncope, the head must be placed low, and wine, punch or brandy given in sufficient quantity. If the anæmia becomes extreme transfusion may be necessary. The more remote consequences of anæmia may be removed by good food and large doses of iron.

If the uterus has contracted well hemorrhage occurs only in extremely rare cases. Kiwisch noticed very considerable hemorrhages occurring in disease of the heart and other disturbances of the circulation, in consequence of which there was congestion of the veins of the lower half of the body, and attributes it to abnormally large venous openings at the placental insertion. Hecker saw a fatal hemorrhage from a varicose vein of the cervix. Mikschik observed it in a case where there was an ulcer of the cervix.

Graily Hewitt reported a fatal case in consequence of repeated hemorrhage from an exposed aneurismal sac of a uterine artery; and Johnson communicates a case in which the fatal bleeding was caused by rupture of a thrombus of the cervix. Hemorrhage from such causes are very rare, but when they occur they are extremely dangerous, since the blood persistently flows from the vessels, even when the uterus is well contracted.

There is nothing more to be done in these cases but to favor the formation of thrombi in the uterine cavity by various injections. The diagnosis can, as a rule, only be made by way of exclusion.

Another kind of very dangerous hemorrhage occurs in the otherwise well-contracted uterus in cases where the placental insertion does not participate in the contraction. This constitutes the paralysis of the placental insertion. The contracting pareuchyma pushes that portion into the cavity of the uterus, where it projects as a nodular tumor, whilst externally a funnel-shaped depression of the uterine wall can be felt. The diagnosis is easily made by a careful examination as long as the cervix is permeable. If the finger of one hand be introduced into the uterine cavity whilst the uterus is pressed against it with the other hand, the projecting piece of the placental insertion can be felt internally, and the depression with the other hand externally. In the highest degree of paralysis the prognosis is very unfavorable, since the continuance of the bleed-

ing causes death. We must endeavor to overcome the paralysis by large doses of ergot, as well as by continued friction of the uterus externally. Or in severe cases an active injection, such as liquor ferri perchloridi diluted with water, must be used to stay the bleeding from the paralyzed part.

Deficient contraction of the uterus also gives rise to some other kinds of hemorrhage which have already been mentioned, as in inversion and in folding-in, and in fibroid tumors of the uterus.

Besides the hemorrhage immediately following delivery others may occur a few days after or even later, coming on suddenly and in more or less abundance; or the sanguineous lochia may continue for an unusual time, and may thereby (at least temporarily) become so profuse that the patient is weakened. Such hemorrhage is, as a rule, due to something being retained within the uterus; this is for the most part coagulated blood or a piece of the placenta.

The portions of the ovum retained in the uterus undergo various changes. If they are not too large, as only a small cotyledon of the placenta, they are thrown off, as a rule, with the piece of the decidua which remains in the uterus, and are discharged with the lochia, without giving rise to any other symptom than that which the thick fetid lochia produce.

In other cases, very frequently, but by no means always, after operations in which air has entered the uterine cavity, as, for instance, in artificial detachment of the placenta, the pieces left putrefy, and may then cause an intensely putrid discharge, giving rise to septicæmia and endometritis, and thus may occasion all the complex symptoms known as puerperal fever. The portion of the placenta left behind may continue perfectly fresh after premature labor and labor at term, as it at times does after abortion, and may give rise, even at a late period, to profuse and obstinate hemorrhage.

By the retention of such pieces at the placental insertion polypoid tumors may form in the puerperal uterus, which acquire considerable practical importance.

Small fibrinous coagula intimately blended with the projecting thrombi at the placental insertion are quite commonly found in the bodies of puerperal women. But larger coagula also, the result of repeated hemorrhages, either of a round shape the size of a walnut, or flat and lobulated, which may also project into the uterine cavity like a cockscomb, are by no means rare. We ourselves had lately an opportunity of observing such a case. Those cases only are very rare where large fibrinous coagula of a polypoid shape are seated at the normal placental insertion, and project with their obtuse end into the cervix or into the vagina. A fibrinous polypus of that kind, the free polypous hæmatoma of the uterus (Virchow), consists of coagulated fibrine, including a nucleus of coagulated blood.

It is not quite known what circumstances favor the formation of fibrinous polypi. They do not exclusively occur in an excessively large uterine cavity, and, on the other hand, there are very large uterine cavities which do not contain large coagula at the placental insertion. A peculiar roughness or too great projection of the placental insertion into the uterine cavity appears chiefly to predispose to their formation (therefore greatly prominent thrombi and paralysis of the placental insertion are associated). We have, however, lately seen two cases with very considerable coagula, and there was no question of an excessive roughness.

The fibrinous polypus occurs after premature labor and after labor at term. If it forms after abortion it appears to favor the return of hemorrhage at a much later period (after weeks or even months), whilst after labor at or near term it produces hemorrhage in the first or second week of the puerperal state.

Polypoid formations are far more frequently observed when one or more pieces of the placenta have been retained. Upon these pieces blood is deposited in the way just mentioned, and a fibrinous polypus is formed with a pedicle of placental tissue, or the retained cotyledon becomes bloodless, firm and hard, and assumes a shape corresponding to that of the uterine cavity. This forms the so-called placental polypus.

Under such circumstances hemorrhage takes place at an early period of the puerperal state. Sometimes, however, an abundant flooding does not occur before the end of the first week, more frequently in the second, and often in the third; and this may be repeated unless the polypus be removed.

The diagnosis of such polypi is not difficult, because the internal os, normally closed at the twelfth day, in such cases remains patulous for a much longer time, or reopens with the repeated hemorrhage. The tumor very rarely projects into the vagina; sometimes, if the uterus is approached to the examining finger by pressure externally, it can be felt in the external os, but, as a rule, in the internal os, surrounded on all sides, and attached to the uterine wall. The uterus is usually slightly anteflexed, and, apart from the increase in its contents, appears to have undergone the normal changes.

When the disease has been recognized early and the proper treatment instituted, the prognosis is not unfavorable. In other cases death may follow from the hemorrhage, from the decomposition of the polypus, or from septic endometritis.

The cause of the hemorrhage can only be obviated by the removal of the polypus. This may be done, as a rule, by a little manipulation, the soft polypus easily yielding to the pressure of the finger, or the hard pedicle is nipped off by the finger-nail.

If two fingers can be introduced, the removal of the polypus is much easier. If the pedicle cannot be separated in this way, the uterus must be fixed in a suitable position from without by an assistant, a forceps is introduced, guided by the finger in order to grasp the polypus, and it is now removed entire or in pieces by pinching or torsion.

After the removal of the polypus the bleeding stops, as a rule, and thin, slightly colored, sometimes also thick streaky, lochia are discharged. If the bleeding still persists after the removal, injections of diluted liquor ferri perchloridi should be made. The internal os contracts only slowly, and the woman requires much care and attention for a long time.

A thrombus or hæmatoma of the vagina or vulva consists in an effusion of blood into the submucous connective tissue of those parts.

Larger blood tumors of that region are not frequent. According to Winkel hæmatoma occurs once in 1,600 births. It appears to be somewhat more frequent in pluriparæ. Greatly varicous dilatations of the veins do not predispose to it. If the mucous membrane over the bleeding vessel tears at the same time, the blood escapes externally, otherwise a tumor is formed in the surrounding connective tissue. Effusion of blood externally and into the tissue may both occur together.

As a rare exception, the rupture occurs in the latter part of pregnancy, as in the case communicated by C. Braun. As a rule, the passage of the head causes the rupture. The tumor is not always seen immediately after the expulsion of the child, and this is partly due to the slow bleeding, partly also to the gradual necrosis caused in some cases by the pressure upon the venous walls and the consequent escape of blood. Such ruptures very rarely occur in a later period of the puerperal state after great bodily exertions, as in the case of Helfer, on the twenty-first day.

The seat of the tumor varies according to the place of injury. If the latter is beneath the pelvic fascia, the blood descends into the greater labium, more rarely into the smaller or towards the perinæum. If the bleeding vessels are situated between the pelvic fascia and the peritoneum, the tumor may at first extend upwards, and may infiltrate extensively the subserous connective tissue on the iliac bones, towards the kidneys, and also towards the umbilical region, but it may also gravitate downwards. Usually the tumor is situated only on one side, but on account of its large size it may extend also to the other side. Very rarely hæmatomata occur on both sides independently of each other.

The somewhat larger tumors are always attended by pain, which, apart from the size of the tumor, is the greater the more rapidly the bleeding occurred. The tumor may contain such a quantity of

blood as to give rise to symptoms of excessive anæmia, though hardly a case of death is met with without external hemorrhage. In very rapid extravasation the pressure of the blood may cause the superjacent skin or mucous membrane to burst, and the consequent external hemorrhage will certainly then prove fatal.

If the size of the tumor is not very considerable, it usually happens that the liquid constituents are reabsorbed, and the thickened coagula of blood are encapsuled. If the tumor is very large its covering (sometimes the recto-vaginal wall) mortifies under the pressure, and the effused blood now escapes, partly coagulated, partly dark and liquid. Repeated bleeding may again bring imminent danger, or death may follow from septic infection, due to the putrefaction of the greatly compressed sinuous walls. But the sac may also gradually cicatrize with suppuration, sometimes forming perineal or rectal fistulæ.

The diagnosis offers no difficulties. The rapid formation, with the attending anæmia, the blue color of the mucous membrane covering it, and frequently also of the external skin, and the liquid contents (the tumor feels uniformly elastic, sometimes even fluctuating), exclude all other kinds of tumor which may arise here.

The prognosis is the more unfavorable the larger the tumor. After rupture of the covering the effusion of the blood or the subsequent suppuration and putrefaction may cause death. But most cases of thrombus terminate in recovery. According to Winkel, death occurred six times in fifty cases (three times by bleeding).

Prophylactic measures can scarcely be taken, since hæmatomata mostly arise quite unexpectedly, and do not occur in cases where, from the presence of large varicose veins, they might be suspected. If the tumor is observed early, and whilst it is still increasing in size, its growth must be diminished and coagulation and thrombosis favored by the use of compression and cold. Both indications are best met by the introduction of a caoutchouc tampon filled with ice-water. If the enlargement of the tumor has stopped, there need not be any active treatment as long as particular symptoms do not demand it. Even now the formation of thrombi may be very suitably favored by the application of ice. The most favorable termination is always that of absorption without opening the tumor. If the coats of the tumor do not mortify, and if parts around do not become the seat of a more intense inflammation, the tumor, on the contrary, becoming harder and smaller, the treatment ought to be merely expectant. Thus tumors, even larger than a fist, may heal without accidents, leaving behind only an inconsiderable swelling.

If the skin, however, becomes discolored and threatens to burst, an incision ought to be made into the tumor, the cavity emptied, and a suitable tampon used, in order to prevent any further bleeding. If this does not succeed, the cavity may then be syringed out with vinegar or diluted liquor ferri perchl., or the tampon again may become necessary. Injections, however, always delay the healing process for a long time. The incision is to be made at the most dependent part, and this may also be found advisable, simply on account of the size of the tumor, without there being any urgent symptoms. It is best to wait three or four days (the longer it is possible to wait the less easily dangerous after-hemorrhages occur), then a large incision is made, all coagula are removed, and the cavity treated like a large abscess. Purifying injections are made, and by a careful and gradual compression from above we shall favor union of the walls of the abscess.

F.—DISEASES OF THE MAMMÆ.

1. *Diseases of the Mammary Glands.* (*a*) *Anomalies of Secretion.*—The quantity of milk secreted by the mammary gland varies greatly in different individuals. Some women have for years a great abundance of milk, whilst others are after a short time no longer able to satisfy the child.

The secretion of milk is very rarely completely stopped during the puerperal state—agalactia—without sufficient reasons to account for it. More frequently the secretion is only imperfect and ceases entirely after a short time. This may be due to an imperfect development of the gland, which sometimes is congenital, but also occurs in very young and very old mothers. It is more frequently found in very feeble women, whose state of nutrition is faulty and unsuitable, and in great general development of the panniculus adiposus. Great mental excitement also may cause a sudden suppression of the lacteal secretion. A gradual diminution of the secretion occurs especially frequently from unsuitable or unaccustomed nourishment. Intense fever and severe watery discharges may rapidly diminish the quantity of the milk.

Cases where the want of milk is due to an atrophied gland or to a general adiposis are, of course, not accessible to treatment. In the other cases the regulation of the diet is of the first moment. A nursing woman must generally be left to her customary habits of life. She has to avoid overwork and great fatigue, and her customary food must be of good quality and in sufficient quantity. The existing secretion of the milk is best maintained in this way. Milk, farinaceous food, and beer, favorably influence the lacteal secretion.

If menstruation returns in suckling women, the nursing need not, as a rule, be interrupted, for in the great majority of instances the secretion of the milk does not diminish and the child thrives.

In very rare cases the secretion of milk becomes so abundant that the general health suffers under it—polygalactia; or after the weaning of the child a secretion of milk, which weakens greatly, continues in the majority of cases from both breasts—galactorrhœa. The quantity of milk secreted may amount to five pounds daily.

In such cases symptoms appear very similar to long-continued bleeding or suppuration. The nutrition of the woman suffers; great weakness and emaciation follow a too long-continued nursing. Menstruation thereby often becomes very abundant, and profuse hemorrhage sets in, which can only be stopped by the weaning of the child. Prolonged nursing has also a very unfavorable influence on women suffering from osteomalacia.

Disturbances of vision (hemeralopia, amblyopia, amaurosis) also occur in puerperal women who do not suffer from anomalies of the lacteal secretion; they consist in a hyperæmia of the conjunctivæ and no changes can be detected by means of the ophthalmoscope. The prognosis is always good. The disturbances of vision disappear in a few days or weeks.

The great abundance of the secretion of milk can be rapidly diminished by copious watery stools, which are obtained easily and without harm by sulphate of magnesia. The quantity of food also must be somewhat restricted.

Galactorrhœa may be diminished by pressure. Of internal medicines iodide of potassium is principally to be recommended. With the return of menstruation galactorrhœa, as a rule, stops. Abegg cured two cases by producing uterine hemorrhage by the application of the douche.

Very little is known of the qualitative changes of the milk. Change of food appears to have more influence on the quantity, and secondarily only on the quality. Experience has shown that mental emotions of the mother may cause qualitative changes of the milk, but that influence has frequently been overrated.

(*b*) *Inflammation of the Mammary Gland; Milk Fever; Mammary Abscess.*—The parenchymatous inflammation of the mammary gland—mastitis—in the puerperal state, may pass off in a few days without any consequences, or may go on to suppuration.

The former and milder form is a gradual transition from the physiological development of the lacteal secretion in the puerperal state.

Even in the perfectly normal course of the puerperal state, the temperature is highest on the third or fourth day, and this elevation, as has been shown elsewhere, is not due to the genital organs proper, but is undoubtedly connected with the secretion of milk.

If the mammæ are not very sensitive and the temperature is only slightly elevated, the function then strictly remains within physiological limits. Not infrequently, however, the secretion begins with somewhat more marked symptoms. The gland is greatly

swollen, the whole or at least parts of it are extremely sensitive, and there are spontaneous pains; the skin is tense and inflamed, the lymphatics are often seen to proceed to the swollen lymphatic glands in the axilla. The temperature rises on the third or fourth day to 39° C., or even 40° C., and may remain three to four days at an abnormal height with morning remissions.

Such an inflammation most frequently, but not exclusively, occurs in cases where the child has been applied to the breasts too late, or where (on account of the weakness or the abnormal condition of the nipples) not much milk has been drawn from the gland, or where the infant is not nursed by its mother. In most of these cases the inflammatory symptoms and the fever abate after the first or, more rarely, after the second day, and the function of the gland then becomes normal.

As there are unmistakable signs of a local inflammation, and as, doubtless, the fever is due to that inflammation, the name of mastitis may be reserved, as it is usually done, for the suppurative inflammation, and the symptoms in connection with the commencement of the secretion of milk may be designated as "milk fever."

Although the inflammatory state just described disappears in a great majority of instances, yet there are exceptional cases where, under unfavorable conditions, suppuration sets in.

Abscesses of the mammary gland, however, develop at a later period, after the slight inflammation connected with the commencement of the secretion has long since disappeared. Exceptionally the abscess begins during pregnancy, and continues into the puerperal state.

Suppurative inflammation of the mammary gland commonly arises through the small chaps of the nipple, and through the scab formed on it occluding the excretory ducts of some of the lobes of the gland. The secretion is pent up, the lacteal ducts and gland-vessels are dilated and inflamed, and suppuration begins in their walls. It is known to occur from an accumulation of milk in the bearsts from the sudden weaning of the child. It only exceptionally occurs that the suppuration is caused by an injury, as a blow.

As a rule, only one lobe of the gland of one side is inflamed, yet through improper treatment almost the whole gland may suppurate; more frequently the inflammation commences somewhat later in another lobe or in the whole gland.

The first signs of suppurative mastitis are the general characters of inflammation. The gland becomes swollen, spontaneously painful and tender on pressure, and the skin reddened. It is accompanied by a great elevation of temperature, even to 40° C., and often preceded by a rigor. The more superficial the inflammation is the easier the doughy feeling is obtained which indicates the subjacent pus. There is fluctuation in large abscesses only, but when a greater portion of the gland has suppurated fluctuation becomes very distinct. The fever, which was very high at the onset, usually falls again on the second or third day, or at least there are great remissions, and then passes into a prolonged suppurative fever. The most prominent symptom is pain. It may become so severe that it entirely deprives the patient of her sleep. It only ceases when the abscess is artificially opened, or when it spontaneously bursts. Gradually the connective tissue above the abscess is more and more thinned, the skin becomes bluish, the abscess points, and perforation follows through a small opening, which frequently closes again. Other openings may then form, and the skin between them becomes necrosed. The bursting usually takes place after several weeks.

Sometimes the abscess very early communicates with a perforated lacteal duct, through which the pus escapes with the milk. The symptoms just described are then far less severe, and spontaneous pains may be entirely absent. It is in such cases that a diagnosis can easily be made by pressing pus out of the nipple.

After the spontaneous bursting also suppuration commonly lasts a long time, and months may pass before the abscess has closed. If it communicates with a lacteal duct at the place of perforation a lacteal fistula may remain, which closes spontaneously when the secretion of milk has ceased. It is extremely rare that in otherwise healthy puerperal women the gland mortifies, and that death follows from ichorrhæmia. Sometimes the abscess remains so long open, that gradually the whole gland suppurates. By means of an incision an enormous quantity of pus will be discharged in a thick stream, and the skin of the whole gland will collapse like an empty bag.

The diagnosis of mammary abscess is easy. The sensitiveness of the swollen lobe, the change of the original hardness into a soft doughy consistency, together with the symptoms of the general state, make the diagnosis certain.

The prophylactic treatment consists, first of all, in careful attention to the chaps. Though the first symptoms of inflammation may already be present, suppuration can be prevented by energetic treatment. The breast is to be supported by a suitably arranged suspensory bandage, and sulphate of magnesia should be given until a few watery stools follow and the breasts become thinner. This treatment, early applied, is just as efficacious as the often-praised starch bandage, which is said to prevent suppuration by uniform compression. Simple and useful also is the painting with collodion, which may, however, easily cause excoriations. If suppuration has begun, incisions must be made as early as possible. As soon as a soft spot is felt an incision, not too small and rather deep, must be made in a line radiating from the nipple, and the pus evacuated as completely as possible.

If the incision is kept open the process does not extend any further, and the cavity of the abscess heals up spontaneously if it is always sufficiently emptied. It takes a long time before the cicatrization is complete. To accelerate that process various remedies have been recommended. Winkel strongly recommends the starch bandage. This is very troublesome, as it has to be renewed frequently; if that effect is desired, collodion exerts excellent compression on a tense breast before the abscess is opened, but is not applicable in a flaccid breast. Most simple of all is the compression by suitably arranged napkins and the daily emptying of the cavity of the abscess. If the abscess is in the lower lobe a simple suspensory bandage suffices; if it is higher, the bandage must be applied around the thorax.

If the pus is thin and the granulations flabby it is well to stimulate the healing process by the injection of a solution of nitrate of silver.

An abscess does not render the weaning of the child absolutely necessary; but if an abscess communicates with the lacteal duct it is advisable to wean the child, at least from the diseased breast. The sinuses and lacteal fistulæ which remain commonly heal only when lactation is entirely stopped.

(*c*) *Galactocele.*—It very rarely happens that when the excretory duct is occluded the secretion still continues without an abscess developing. The lacteal duct becomes more and more dilated, and even forms a large cavity, or one of its walls ruptures, and the milk remains in the newly formed abscess-like cavity. Usually these milk-abscesses are small, yet they may acquire an excessive size, as in the case of Scarpa, where the tumor descended to the left flank, and contained ten pounds of milk.

The tumor at first contains pure milk; later on, the serum separates, and the solid constituents are inspissated, or hemorrhage into the cyst produces a mixture with blood and of a great variety of colors.

The diagnosis may be very difficult. If the wall of the lacteal duct has not ruptured, from the hard consistency and the distinct fluctuation it may be easily mistaken for a cyst, and after rupture into the surrounding tissue for an abscess.

The treatment is not materially altered by the uncertainty in the diagnosis. After puncture alone the contents again accumulate, and inflammation of the walls of the duct must be produced by injections of iodine. If the cyst does not close in this way it must be laid open by an incision, and allowed to close by suppura tion.

2. *Inflammation of the Breast.*—The phlegmonous inflammation of the connective tissue of the breast may be limited to circum-

scribed spots of the areola. The inflammation then usually proceeds from the fissures of the nipple or from the glands of the areola to the connective tissue in the immediate vicinity. Around the nipple small furunculous abscesses form.

Besides the implication of the connective tissue, which regularly occurs in parenchymatous mastitis, there are also during the puerperal state inflammations of the connective tissue, with a tendency to suppuration, most frequently due to an injury. More frequently this is phlegmonous erysipelas in consequence of septic infection from slight excoriations of the nipple. They are either limited to the breast, and may then terminate in an abscess, or they may end in mortification, and death may follow in consequence of an infection of the whole organism. When abscesses form, the pus must be evacuated as early as possible, and this is done by multiple, large, and deep incisions.

In rare cases the submammary connective tissue between the gland and the thorax inflames in the puerperal state. This is the consequence of a blow or of the implication of the connective tissue in the inflammation of the deeper glandular lobes.

The breast is swollen and feels as if it rested on a water-cushion. The base of the breast becomes œdematous. Unless incisions are early made, it may go on to tedious and dangerous burrowing of the pus.

3. *Diseases of the Nipples. Chaps.*—The nipples, covered by a delicate epidermis, are in women who nurse easily exposed to disease. Various conditions predispose to it. By nursing the child or the flow of the milk, the nipple is softened, and the epidermis is raised in the shape of vesicles, which form scabs, under which the epidermis is replaced. Also at the tip and the base of the nipple folds are found, where the epidermis is still more tender and more closely adherent. If the folds have been bridged over by scabs formed of discharged colostrum and dirt, and if the scabs are torn asunder by sucking, the folds are opened up in their entire length, and chaps result. In women in whom those folds are little developed, so that their nipples have quite a smooth appearance, chaps are not easily formed. Others, on the contrary, have deeply fissured nipples, and on separating the small papillæ, even before the child is applied, red, somewhat moist and painful spots are seen. Chaps in these cases are seldom absent when the child begins to suck. Nipples also which freely project, so that the child can grasp them without trouble, are much less disposed to the formation of chaps than those which the child must continually drag upon in order to retain its hold on them.

These chaps are a great source of annoyance to nursing women. Nursing the child causes very severe pain, whilst the simple excoriations with small scabs and ecchymoses are much less sensitive, but may, of course, lead to actual chaps. The chaps also may cause intense fever, though this is absent in most cases. The occurrence or absence of the fever depends partly upon the size of the chaps, partly also upon their depth, and the sensitiveness and irritability of the individual. In some cases the fever may rise to above 40° C., but with the cessation of the irritation it rapidly abates.

If the chaps are neglected they become deeper and more sensitive. The women are in a continual state of anxiety, and greatly dread each fresh application of the child to the breast. There is want of sleep, the appetite is diminished, and fever consumes their strength. In suckling the child the nipple is involuntarily drawn back for fear of the pain, so that the chaps are still more torn open, and, at last, when the pains become too severe and the secretion of the milk ceases, the child has to be weaned. Under certain circumstances the chaps may extend so much in depth that the nipple is almost entirely separated from the breast, and the connection is maintained only by the lacteal ducts.

In other cases the resulting scabs occlude some of the larger lacteal ducts, and in the corresponding glandular lobes the secretion is retained, which is followed by a parenchymatous inflammation, often terminating in suppuration.

Prophylactic measures are required even during pregnancy. Care must be taken that the nipples sufficiently project and that the epidermis is somewhat hardened. The former is obtained by frequent traction with the fingers or with sucking glasses; the latter by scrupulous cleanliness of the nipples and frequent washing with cold water, spirits of wine, or if the skin is very tender with weak solutions of tannic acid.

If the woman begins to suckle with prominent, healthy nipples, chaps do not easily form. If, nevertheless, the nipples remain small, so that the child can only grasp them with difficulty, the milk pump must be used before the child is put to the breast, and the child will then find the whole nipple full of milk.

When there are chaps it is best to cauterize them immediately with the solid nitrate of silver, so that the whole base of the chap is covered over by an eschar. The child, of course, cannot be put to the breast until the surface beneath the scab is healed, else the scab would be torn off and the chap again irritated.

If the child cannot be weaned for so long a time, the base of the chap must be frequently cleansed, or the base is cleared by cauterization, and a few threads of charpie soaked in a solution of tannic acid (gram j in 30—50 grammes of water) are placed into the chap. If this is kept clean, or treated as recommended, it rapidly fills from below upwards and heals.

G.—Mental Diseases of Puerperal Women.

The mental diseases of puerperal women have by no means particular and distinctive characters. It suffices to say that gestation, labor, and the puerperal state are very powerful etiological factors in certain mental disturbances.

Daily observation shows what a great *rôle* the sexual apparatus plays in the psychical life of women. Witness hysteria, and its intimate connection with diseases of the genital organs. Already in the physiology of parturition attention has been drawn to its influence upon the mental state of women. Sometimes seriously disposed women become excessively merry, whilst, on the contrary, gay young women easily assume a serious, even shy and melancholy disposition. But in rare instances this latter goes so far as to develop into a real disease. Most frequently the gloomy frame of mind passes off with the puerperal state.

The influence of pregnancy upon the cerebral organs may partly be explained on physiological principles. The congestions to the head which accompany pregnancy may just as well give rise to nutritive disturbances of the brain as they do to the formation of osteophytes in its bony envelope. And not only is the great quantity, but also the abnormal quality, of the blood concerned in those nutritive disturbances. The not infrequent acute hemorrhages during pregnancy and parturition are undoubtedly in some causal connection with the psychical state, which arises from the puerperal condition.

The fact also must be borne in mind, that often pregnant and parturient women are extremely sensitive to psychical affections, and this is especially the case with those illegitimately pregnant. In a great number of the mental diseases of women, the origin of the disease can easily be deduced from the puerperal state. It is, of course, easily intelligible that the predisposing causes which are to be taken into consideration in other causes of mental diseases are of great moment as regards the origin of those diseases after child-bed.

Corresponding to the state of mind displayed during pregnancy or parturition, the psychical disturbances are either those of depression or of exaltation.

The slight forms of melancholy usually originate during pregnancy, and are continued into child-bed, where they may develop into the graver forms of melancholy.

The attacks of mania most frequently occur during parturition. At the moment when the head passes the vulva, and when the suffering reaches the highest degree, acute mania is not rarely seen. Otherwise patient and intelligent women suddenly cry out loudly, wildly stare around them, and menace and strike those who are near

them. In the great majority of instances this state disappears immediately after the expulsion of the child, but exceptionally it may also continue after delivery.

Attacks of mania accompanying puerperal diseases are also symptoms of cerebral irritation.

The prognosis of mental diseases originating during the puerperal state is, on the whole, relatively favorable.

As regards the treatment, it is best to watch the patients carefully until their conditions will allow them to be removed to an asylum. Melancholic lying-in women must never be left alone on account of the possibility of their committing suicide.

Appendix.—Sudden Death in the Puerperal State.

We shall have to consider those sad cases where death quite suddenly and unexpectedly occurs in lying-in women who have been perfectly well or only slightly indisposed.

The more frequent causes of sudden death, such as very profuse hemorrhage, the very acute form of septic infection, dangerous apoplexies, or rupture of the heart in consequence of acute myocarditis, of which Spiegelberg has observed a very interesting case, have already been mentioned in the previous chapters. It only remains to speak of two not very rare causes of sudden death during or after delivery, namely, embolism of the pulmonary artery and entrance of air into the uterine veins.

1. *Embolism of the Pulmonary Artery.*—As already stated above, embolism occurs most frequently in the course of puerperal fever. Under the influence of the septic infection the thrombi which have formed in the veins, either as a physiological process or in consequence of an extension of the inflammation of the connective tissue around the veins, become disintegrated. However, in the great majority of instances only the smaller branches of the pulmonary artery are the seat of those embolisms, because the thrombi usually break down into very small fragments.

Embolism is happily very rare apart from septic infection. Only, if a physiological thrombosis continues into a larger vein, a piece of the thrombus may be washed away by the current of the blood. Such a large thrombus may then pass through the right heart into the pulmonary artery and obstruct it or at least, one of its larger branches. Death occurs then either suddenly or in a few days with symptoms of increasing dyspnœa, cyanosis, and a low temperature. The carefully observed case of Rutter is very instructive in this respect. After the observations of Playfair and others, it is not improbable that recovery may take place under favorable conditions.

2. *Entrance of Air into the Uterine Veins.*—Experience has taught us that air entering into the veins may give rise to very alarming symptoms or even cause sudden death. This has been frequently seen in operations about the neck, when the veins which are situated between the fasciæ, and therefore unable to collapse, have been wounded.

But air may also enter the uterine veins during or shortly after delivery, and may cause sudden collapse or even death. Now, many facts go to prove that in parturient and lying-in women air may and not infrequently does enter the vagina and uterus, not only in operative procedures, but also in simple examinations. But it is doubtful whether the air spontaneously enters the veins, or whether it is pressed into them by the contractions of the uterus, whilst the os uteri is displaced. The cases of Olshausen and Litzmann unmistakably show that such an entrance can take place, when by means of an injection apparatus air is forced with the water into the uterus under a certain pressure.

Every precaution should, therefore, be taken in making injections into the uterus of a parturient and lying-in woman. The piston must accurately fit into the syringe, and every bubble of air must be previously removed from it.

CHAPTER XXIV.

SPURIOUS PREGNANCY, OR PSEUDO-CYESIS.—*SIMPSON.*

The author of the two remarkable dissertations on "Diseases of Women," usually published among the Hippocratic treatises, when at one place treating of displacement and stricture of the os uteri, takes occasion to remark that sometimes under such circumstances "the menstrual fluid is determined to the mammæ, and produces their enlargement; the abdomen swells, and inexperienced patients believe themselves to be pregnant; in truth," he continues, "they present all the phenomena usually seen in women at the seventh or eighth month of utero-gestation; the belly attains a proportional degree of enlargement; the breasts swell up, and milk seems to be secreted. But when this period has passed, and the full term of pregnancy should be complete, the mammæ shrink up and diminish in size, the abdomen likewise collapses; all trace of the milk disappears, and the abdomen sinks in, and all tumefaction is dispelled."

The diseased state described in the preceding quotation is that state usually spoken of as the state of "spurious pregnancy." In his "Nosology," Dr. Mason Good proposed to describe this peculiar affection under the corresponding Greek name of "Pseudo-cyesis," from φένδος, a lie, and κύησις, pregnancy. We have lately had two examples of this disease among patients visiting the female ward. One of the patients, who remained in the ward for a short time, suffered from suppression of the menses, continuing for a period of three or four months, and alternating with a state of menorrhagia; she had occasional sickness; the mammæ were slightly enlarged, and the abdomen somewhat protuberant. She suffered, in short—but not in a well-marked degree—from this morbid condition of spurious pregnancy. In the other patient, who was under the medical charge of one of the students of the class, not only were all the usual phenomena of pregnancy well-marked for the usual time; but, what is far less frequent, there latterly supervened all the common phenomena of labor; but of labor without any result, as the uterus was quite empty.

There are two varieties of pseudo-cyesis or spurious pregnancy, a *local* and a *constitutional*. The former I have already described to you as seen in those cases of dysmenorrhœa where the patient has occasionally, or even at every monthly period, excessive development of the mucous membrane, which becomes vascular and swollen, and is in part shed off in the form of a separate membrane, resembling in every respect the decidual membrane which is formed in the early weeks of every real pregnancy. In such cases the patients usually suffer a great deal of pain during the expulsion of these uterine casts, and they are sometimes affected with some of the ordinary constitutional and sympathetic phenomena of pregnancy. Thus they frequently are troubled with sickness and vomiting; the mammæ sometimes become enlarged, and the areolæ darkened for one or two weeks both before and after these dysmenorrhœal membranes are thrown off. The most striking features of the disease in such cases, however, and the most distressing symptoms depend upon the local changes in the uterus; and as I have already discussed these, both as regards their pathology and treatment, in my lecture on Membranous Dysmenorrhœa, I need say no more about that subject now, but pass on at once to the consideration of that more frequent form of spurious pregnancy,

of which the more striking phenomena are all of constitutional origin, and the disease true, or

CONSTITUTIONAL PSEUDO-CYESIS.

In this constitutional or sympathetic variety of spurious pregnancy, then, there may be no appreciable local change whatever; but the patient suffers from nausea and vomiting, and the other sympathetic phenomena common to pregnant females. The mammæ become enlarged, the areolæ are darkened, and the gland gives forth its milky secretion. The abdomen enlarges gradually until it occasionally comes to assume the form, and size, too, of an abdomen which contains a gravid uterus, and the patient feels movements in its cavity, which she unhesitatingly pronounces to be movements of a fœtus. Menstruation is usually pretty methodic, but you will occasionally find it altogether suppressed for a time, or only coming on very irregularly, and with a scanty flow. All these symptoms may arise and go on slowly and progressively for a period of nine months, or longer, and the patient may labor under the delusion that she is in the family-way, until, it may be, symptoms set in resembling the ordinary efforts of labor, and then, when a medical man is sent for to attend at the delivery, it may happen that she first discovers she has never been pregnant at all.

Frequency of the Disease.

Before I proceed to point out to you more particularly the nature of this disease, and to tell you how it is to be recognized and treated, let me first of all remark that it is a disease which, when you come to practice, you will find to be of far more frequent occurrence than the comparative silence of our obstetric text-books on this malady would lead you to infer. It is not by any means confined to the married, or to those who have borne children, but is seen among the unmarried and childless as well. Among the former, however, it is more frequent; and there are perhaps few women in married life who have not presented more or less marked symptoms of it once or oftener. The disease, as we have seen, was known of old, and is duly noticed in the Hippocratic writings. But in modern times medical writers have passed it by in almost complete silence; and the only notice of any importance in regard to it that I know of in the English language is to be found in the admirable and classical work of my friend Dr. Montgomery on the "Signs and Symptoms of Pregnancy"—a work which I beg strongly to recommend to your careful perusal, as a volume not less remarkable for its great accumulation of original and collated facts, than for its logical statements and reasoning, and its elegant and classic style. Yet, as I say, cases of spurious pregnancy are constantly occurring in practice, and patients often go about from one practitioner to another seeking relief, or desiring to obtain some certainty as to the nature of their affection, a point in regard to which they are often in the greatest doubt. They fancy themselves, for the most part, to be pregnant; but sometimes they suppose themselves to be subject to very different kinds of disease, as in the case of a patient from the West Indies, whom I have under my care just now, and who, it was there imagined, had some hydatids in the uterus.

To show you how difficult it is to distinguish cases of simple spurious pregnancy from other forms of disease, let me merely tell you one fact. Six different cases have been put upon record, where patients have been supposed to be laboring under ovarian disease; and in these six cases, when the abdomen was laid open with the view of removing the ovarian tumor, there was found to be no tumor there—nothing unusual or abnormal except, perhaps, a slight degree of distension of the bowels. Such needless tampering with the lives of patients may suffice to impress upon you the dangers of making a false diagnosis, and teach you not to neglect any means by which you are likely to obtain a clearer insight into the nature of this often obscure and puzzling form of disease.

Times of its Occurrence.

As to the period of life when it is most likely to be met with, Dr. Montgomery thinks that it occurs most frequently at the climacteric period, when the catamenial discharges cease to appear, and when the female constitution seems to become more liable to be affected by morbific influences. But I feel pretty certain that the disease occurs at least as often during the first year after marriage as at any later period. At least, you will find, on making inquiries of patients, that they have very often been deceived into the belief that they have become pregnant at the time I refer to, from the temporary suppression of the menses, attended with sickness, and some degree of swelling of the abdomen; but, probably from the circumstance that the delusion is not usually kept up for such a length of time in these patients, they do not so often come under the observation of the practitioner, and are thus very commonly altogether overlooked. Spurious pregnancy, however, may occur at any period during the catamenial life, and it is often enough developed during the intervals between two successive real pregnancies; and a succession of attacks is sometimes seen in the same individual.

May the Disease occur in the Unmarried?

Certainly, and then it constitutes a very delicate class of cases. When occurring in the unmarried, it is usually set down as hysteria; but sometimes all the characteristic phenomena are most distinctly indicated, and it is then a very difficult and delicate matter to answer the patient's inquiries regarding her disease. No one would choose to speak to the patient or her friends of "spurious pregnancy" under such circumstances, as the mere name itself would be sufficiently offensive. Perhaps the descriptive designation proposed by Dr. Good of pseudo-cyesis would save sometimes the practitioner from difficulty—when hard pressed as we sometimes are—to give our patient's affection a proper name. That the affection may occur in the most moral persons, however, and in virgins, is certain; and if any confirmation were needed, it would be found in the fact that it has sometimes been seen among a class of females as to whose morality and state no question can be raised, namely, the females of our domestic animals. Harvey pointed out long ago in his celebrated work on "Animal Generation," that "over-fed bitches which admit the dog without fecundation following are nevertheless observed to be sluggish about the time they should have whelped, and to bark as they do when their time is at hand; also to filch away the whelps from another bitch, to tend and lick them, and also to fight fiercely for them. Others," he goes on to say, "have milk or colostrum, as it is called, in their teats, and are, moreover, subject to the diseases of those which have actually whelped; the same thing is seen in hens which cluck at certain times, although they have no eggs on which to sit. Some birds, also, as pigeons, if they have admitted the male, although they lay no eggs at all, or only barren ones, are found equally sedulous in building their nests." I had a patient in the neighborhood of Edinburgh, who used to keep a seraglio of female dogs, and was interested in observing their habits and physical characteristics. This person was a careful observer, and told me that every year, and occasionally twice every year, some of these "over-fed bitches" had all the symptoms of pregnancy, although they had been kept secluded from all male society. And the phenomenon so often spoken of, of animals without any offspring of their own, adopting and nursing the young of other animals, belonging sometimes to an entirely different class, is doubtless only one of the forms in which this peculiar affection may be manifested.

Mistakes from it among the Married.—But though the disease may thus manifest itself among unmarried females, it is chiefly among the married that the more marked instances of it are met with; and awkward enough are the mistakes into which those sometimes fall who are affected by it. I have repeatedly known ladies make all the usual preparations for confinement, secure the services of a nurse and medical attendant, lay in a stock of baby-clothes, and, in short, have everything in readiness for the birth of a child, when they were in reality not pregnant at all. They may sometimes even be put to very great inconvenience in consequence, breaking up

their large establishments in the country, and coming into town at most unseasonable periods, in order to be under the immediate care of their usual accoucheur. I have thrice had ladies come into Edinburgh to be confined under my care, leaving establishments, who, when they came up to town, proved not pregnant. A striking instance of this kind occurred, in the practice of my predecessor, Dr. Hamilton, who was engaged, not very long before his death, to attend a lady in her approaching confinement. As the expected period drew near, a heavy fall of snow came on and blocked up the roads, and the lady, terrified at the idea of being detained in her country house, had a number of laborers set on to cut a driving-path through the snow; but it was unnecessary work and trouble, as the case was only one of spurious pregnancy. Such mistakes oftenest occur in patients pregnant for the first time, and who are inexperienced as to the phenomena and sensations of pregnancy. But the affection is by no means limited to them. You will frequently enough in practice find women who have previously borne children making such mistakes about themselves, and imagining that they feel every movement of the child just as they have done in real pregnancies. In some cases, but they are much more rare, you may have the phenomena of spurious parturition as well as spurious pregnancy. That is, when the ordinary term of nine months has been completed, there may supervene the phenomena of a common labor. The ordinary preliminary symptoms are first seen, the pains set in at first irregular, slight and resembling the pains characteristic of the first stage of labor, and gradually change into the regular, strong, expulsive pains, characteristic of the second stage. The more complex phenomena of instrumental labors are even occasionally simulated. Dr. Labatt was once called to deliver a child by means of craniotomy, in a case where a medical practitioner had been in attendance for two days, and where, when he went, there was found to be no child at all. I myself was once sent for by one of the best medical students we ever had at this university, to perform the operation of version on a patient on whom he had been some hours in attendance, and which he fancied to be a case of unavoidable hemorrhage. But turning of the child was unnecessary, as there was, in fact, no child to turn! The patient was suffering from menorrhagia as a termination of spurious pregnancy. There was a striking example of this disease in the hospital here a few years ago. The patient was sent in from a distance in the country to be delivered of a child, of which she had been supposed to be long in labor. Her medical attendant had no doubt as to the reality of the pregnancy and the labor, and her husband who accompanied her to Edinburgh had as little. Their belief was grounded chiefly on the distinctness and force of the movements of the supposed fœtus, which were so marked and strong as to lead the husband to maintain that, if there was no child within his wife's abdomen, there must be some animal there! The case was seen by Drs. Moir, Weir, and several other medical men here, and all agreed that the movements were very deceptive; but on close examination they could be distinctly traced to the peristaltic action of the bowels. The uterus was perfectly empty. I have now seen two cases where the propriety of having recourse to the Cæsarean section was proposed in instances of spurious pregnancy. One of these has been fully and ably described by Dr. Keiller, in the *Monthly Journal of Medical Science*. In the other case I was called to perform the operation on a woman who was dying of some chest disease, and who was believed to have in her womb a living child. But there was no pregnancy whatever.

These symptoms of labor may all recur once and again, even in the same patient, and yet her faith in the reality of her pregnancy may remain unshaken. It is, indeed, most curious to witness with what persistence some such patients, but by no means all, will maintain their belief. The idea that she is in the family-way has such a firm hold of the patient's mind, that it looks as if her brain were impregnated and not her womb, and sometimes no kind of argument suffices to make her change her opinion. You may, it is true, succeed in convincing her at times that her hopes are futile, and you may fondly imagine that you have succeeded in utterly dispelling her empty expectations; but two or three weeks or only days afterwards she will return to you as strongly impressed with the genuineness of her pregnancy as ever. No persuasion or eloquence of yours will hardly ever lead her to give up her hope; time alone can prove to her how vain it is, and with some patients it takes a very long time too. I have known the idea obstinately persisted in even for years.

Symptoms and Diagnosis.

It is not always so easy as you may imagine to recognize a case of this kind, and to discriminate between a case of spurious and a case of real pregnancy, for in the former you will sometimes meet with all the individual and combined phenomena which are ordinarily developed in the latter, and which are usually regarded as characteristic of the pregnant state. The breasts are enlarged, and their areolæ darkened; the menses are often irregular or suppressed, and the abdomen is swollen; the patient suffers from morning sickness and occasional vomiting; and after a time she remarks peculiar sensations in the abdomen, which she unhesitatingly attributes to quickening, or the movements of a fœtus. I have said the abdomen is swollen; and let me add, this swelling sometimes imitates very exactly the defined form of the enlargement of the abdomen in true pregnancy; but usually it is more diffuse and less projecting forwards when the patient is laid supine; and in spurious pregnancy, let me add, there is often observed a symptom in the way of external configuration which is rarer in true pregnancy, viz.: an appearance of unusual constriction in the region of the diaphragm, or where the chest and abdomen meet, so that the lower ribs look as if they were drawn inwards. All of these common symptoms of true pregnancy may be, and indeed often enough are, manifested in cases of spurious pregnancy; but you will often find, on making more minute inquiry, that there is some startling *exceptional* condition affecting one or more of them. Thus, menstruation is occasionally entirely suppressed—as completely so as in any true pregnancy; but in most cases it is not entirely suppressed, but only irregular, appearing one month and absent the next, or coming on at irregular and unusual periods, or in some abnormal way. Again, the movements of the supposed child, if carefully investigated, are found to be different in some respects from the usual fœtal movements. They may first be perceived unusually early, or, on the other hand, at a period much later than that when the movement of real quickening should first be noticed; or they are felt higher up towards the diaphragm, or much further to one side than is ever the case with fœtal movements. And if you inquire of a patient in this condition of simulated pregnancy who has previously borne children, she will generally admit that the movements differ in character from those which she had been wont to feel when truly pregnant, although she had never paid any particular attention to these differences so long as she believed the sensations to be due to the stirring of a child within her womb. There is, I say, usually some irregularity in the form of some one or other of the leading individual symptoms, although the combination of them all apparently in perfection is at first very striking and extremely puzzling. You must make up your minds to meet, in many cases in the most distinct form, with some of the single symptoms which are looked upon as the most characteristic, and which are ordinarily supposed to be conclusive and incontrovertible evidences of the occurrence of impregnation. Thus the mammæ may undergo all the usual changes which occur in these glands during pregnancy, as happened to a very marked degree in the case of a patient whom I had under my care many years ago with retroversion of the uterus. This lady came to present almost all the symptoms of pregnancy, and the changes in the breast, in particular, were extremely well marked. The mammæ swelled; their areolæ were darkened in color and extended; the cutaneous papillæ became more pronounced, and the superficial veins enlarged and prominent. The lady, as it happened, was an excellent artist, and she made a sketch for me of the appearances presented at this time by the mammæ, making use of a mirror for the purpose. Dr. Radford, of Manchester, was in Edinburgh at the time, and saw the patient along with me. But

I could not make out any enlargement of the uterus itself; and some of the other symptoms were not well marked. By and by, all the constitutional phenomena of pregnancy vanished, and thus showed that the pregnancy had only been a spurious one. Afterwards the same patient became really pregnant, and again she made a drawing of the appearances presented by the breasts, which were not a bit more tumid, and the areolæ of which were not a bit darker in shade or wider in extent, nor their cutaneous glandular follicles more enlarged than they had been when she had labored under spurious pregnancy. One symptom connected with the mammary symptoms which is often present, and often greatly deceives, is the secretion of a serous, milky, or milk-like exudation, from the nipples. In some women, but not by any means in all, there is formed a milky secretion in the mammæ during utero-gestation; and sometimes even in the very early months of that state. When the mammæ, or rather the nipple and its vicinity, are compressed with the fingers, a portion of thin, serous-looking, lactescent fluid escapes from the orifices of the milk-ducts, or it exudes spontaneously and without pressure, and on examining it with the microscope you will see the usual characteristic milk-globules in it. But I have seen these colostrum globules with the microscope in a case of spurious pregnancy as distinctly as they were ever seen in a case of true pregnancy. But marked and striking as these various changes of the mammæ in spurious pregnancy thus sometimes are, you will find that here, too, there is liable to be some irregularity in the symptoms. The secretion of the gland is not set up, or the enlargement of the mammæ is only slight or partial, or the darkening of the areolæ is not very deep or decided, or the glandular follicles of the areolæ are not correspondingly enlarged. Sometimes all the more usual phenomena of pregnancy are present in pseudo-cyesis, and each of these phenomena so far a perfect imitation of the same phenomena in the true state of utero-gestation; but their spurious character is brought out when you inquire into the order or succession in which these phenomena have appeared. Thus the patient sometimes observes the swelling of the abdomen or the quickening of the child before the suppression of the menses, and this inversion of the order of the symptoms at once puts you on your guard, and makes you more careful in your inquiries. Again, if you find a want of correspondence among the symptoms of pregnancy described by your patient, it will equally make you suspicious of her state; as, for example, if she spoke of having had the catamenia suppressed for six or eight months, and the feeling of quickening present for three or four months, and yet the mammæ were not enlarged, nor their areolæ and nipples in any corresponding degree altered and changed.

Again, in pseudo-cyesis the liability to deception is greatly increased, and the difficulty of making a true diagnosis of the disease is often augmented by the imitation or repetition in cases of spurious pregnancy of individual peculiarities and special phenomena presented in former real pregnancies. Let me try to impress this fact upon you by stating some instances of spurious pregnancy in which there was presented such a

Repetition of Special Idiosyncrasies,

seen in previous true pregnancies in the same patient. Some women, as you are aware, are subject during the course of utero-gestation to peculiar discolorations or eruptions on parts of the skin; others to neuralgias in various situations; others to increased secretion of some of the glandular organs; and others to the most remarkable changes in temper and habits. Indeed, there is no limit to the number of peculiar physical signs and functional changes which may be presented by women when pregnant; and when these come to be repeated in the successive pregnancies of the same individual—as is very frequently the case—they may very legitimately be looked upon—and frequently, indeed, they are regarded—as indices of the existence of that condition. But when such a patient happens to be affected with spurious pregnancy, this peculiarity may be repeated, and is then very likely to mislead alike the patient herself and the practitioner into the belief that the pregnancy is a real pregnancy.

Several years ago I saw, along with the late Dr. Taylor, a lady who showed all the usual symptoms of pregnancy; and who, at the same time, was covered over the greater part of the body with a papular eruption, such as she had invariably had in all her previous pregnancies, and never at any other period. Yet on a closer examination of that patient she was found not to be pregnant at all; and the eruption, as well as all the other sympathetic changes, was only symptomatic of a state of pseudo-cyesis. I have seen a case of spurious pregnancy which was peculiar in this respect, that the subject of it had in her successive real pregnancies been troubled with a profuse salivation, which was reproduced along with the other changes in the spurious affection. I saw once a very singular case of spurious pregnancy, where a lady who had previously given birth to eight children, passed one period, and naturally thought she had again fallen in the family-way, because the breasts enlarged and began to secrete milk, while the abdomen became prominent, and she felt movements resembling those of the fœtus. On examining the uterus I found it to be perfectly normal, and only slightly ulcerated around the os; but the lady herself was firmly convinced that she was really pregnant, because, in addition to all the symptoms I have mentioned, she presented this further very peculiar one, that she lost great quantities of hair, and she had always had such a falling out of the hair in her previous pregnancies. This patient, let me just add, had a similar but less decided attack of spurious pregnancy before the birth of her third child. At the famous Gardner peerage trial, a woman, who followed the occupation of a monthly nurse, testified that she could always be perfectly certain of the exact date of her pregnancies from the fact that she fainted whenever quickening took place. Dr. Reid tells of this nurse, that she afterwards came to him as a patient, alleging that she was then seven months gone in the family-way, as she had fainted in the same way as she used to do, and had afterwards felt all the usual signs and symptoms of pregnancy. But on making a more correct examination, Dr. Reid found that she had deceived herself, for she believed that she was so far gone in utero-gestation when she was only laboring under an attack of spurious pregnancy. But the repetition or reproduction in an attack of spurious pregnancy of the exceptional and aberrant phenomena of real pregnancy does not end here. I have told you that a case of spurious pregnancy may end in a kind of spurious parturition, the patient showing all the usual indications of being in labor; and in such a case, if the patient happens in previous real labors to have presented any special and peculiar phenomena, these are liable to be again produced in the course of the spurious parturition. Thus, Klein reports the case of a patient who had always been the subject of convulsions when in labor, and who became the subject of an attack of spurious pregnancy, ending at the usual period in a kind of spurious labor, which was also complicated with convulsions.

But, I repeat, however closely all the ordinary symptoms of real pregnancy may be represented and simulated in the spurious affection, and however minutely even the individual idiosyncrasies sometimes seem in the former may be imitated in the latter, there is usually some deviation from the ordinary course of events, and some difference in the character, order, or correspondence of the ordinary phenomena, which may serve to put you on your guard, and lead to the discovery of the true state of affairs. Such deviation or difference, however, is generally not of itself sufficient to enable you to decide upon the nature of the case, and you can only be sure that you have to do with spurious pregnancy by having recourse to the aid of

Physical Diagnosis.

For this purpose you may avail yourself of the assistance of, 1. Auscultation; 2. Percussion of the abdominal swelling; 3. Of tactile examination of the uterus; and, 4. Of relaxation of the tense abdominal walls by the use of chloroform or other anæsthetics.

1. *Auscultation* affords in pseudo-cyesis only negative results, or ought only to afford such. But I have seen more than one case of the disease in which the practitioner—perhaps led astray by the strong assurances and fervid belief of the patient herself—has imagined that he heard something like the sounds of a fœtal heart, where there was no fœtus present to produce any such sounds. Several years ago I had a lady placed under my care from a neighboring part of the United Kingdom, in whom a physician—who had written a work, and a very excellent work, too, on Auscultation in Pregnancy—fancied he had heard, three or four months previously, the sounds of a fœtal heart; and, though all due preparations were made, no child was born. It was nothing but a very marked instance of pseudo-cyesis. It is only necessary for me now, I believe, in the present advanced state of stethoscopic study and practice, to mention the possibility of such an error, in order to guard you against the committal of the error itself.

2. *Percussion of the Abdomen* is generally a most valuable means of diagnosis in the discrimination of pseudo-cyesis. By its aid you can often arrive at an almost absolute certainty as to the spurious nature of the pregnancy. When the abdomen is swelled up and made prominent from the distension of the bowels with gas, you of course obtain a resonant and even tympanitic sound on making percussion over it; whereas, as you all know, the sound is perfectly dull when the prominence is due to the enlargement of the gravid uterus. But sometimes percussion is painful from the over-sensitive state of the abdominal surface and walls, and sometimes the amount of fat deposited in these walls, and in the omentum—especially in cases of pseudo-cyesis occurring towards the termination of menstrual life—diminishes the applicability and certainty of this diagnostic test. In these, and in other cases, you can usually surmount every doubt and difficulty which may exist by having recourse to the two remaining means of physical diagnosis which I have named.

3. *Tactile Examination* is usually indispensable in order that you may arrive at perfect certainty. In using it you must make a careful physical examination both internally and externally, remembering that the result of that examination may be of the greatest importance, and a matter of momentous interest to the patient. On examination per vaginam you will feel that the os and cervix uteri are small, and you can make out pretty well that the uterus itself is movable. But there is a greater difficulty than usual in judging of the size of the body of the organ in such a case. You can often derive great assistance in making your diagnosis of various morbid conditions of the uterus by applying one hand to the fundus externally through the abdominal wall, while you apply one or two fingers of the other hand to the cervix internally through the vagina, for thus you can catch the uterus between the two hands, so as to define and determine exactly its degree of enlargement. And if in any case of spurious pregnancy, by feeling the uterus simultaneously with both hands, we can thus measure its size and make out that it is of nearly normal dimensions, or at least not by any means enlarged to a degree commensurate with the alleged date of utero-gestation, we have a most decisive evidence of the true nature of the affection. Recollect, further, in making this tactile examination of the uterus, that the organ is sometimes in some degree enlarged in pseudo-cyesis, without there being any disease in it; that the organ may be enlarged also, and to a great degree, from fibroid tumors and other organic causes, a combination with pseudo-cyesis of which I have seen several examples in practice; and above all, that retroversion or retroflexion of the non-pregnant uterus often coexists with pseudo-cyesis, and often leads to the supposition that the uterus is increased in size, when the apparent increase is merely produced by displacement of the viscus. But in some cases of spurious pregnancy it happens that we cannot succeed in making a perfect and satisfactory tactile examination at all; and why? Because the abdominal walls may be, and often are, naturally thick, the subcutaneous tissue being filled with fat; but, independently of that, there is in many of these cases a firm, unyielding swelling of the abdomen, which you might suppose to be due to the enlargement of a gravid uterus, but which is in reality due to a tympanitic state of the bowels, and a peculiarly tonic condition of the abdominal muscles; and the abdominal walls are so firm and tense, and resist the pressure of the hand so effectually, as to render it utterly impossible for you to make out the size and contour of the uterus. Now, how are these obstructions to be overcome? Very simply, by the use of anæsthetics.

4. *Chloroform* will, generally, in any case of doubt, solve the difficulty completely, if only given deeply enough. When the patient is fairly put to sleep with chloroform, the tense abdominal muscles become perfectly relaxed, and on pressing on the abdomen, you will find that the walls will give way before your hand, and sink backwards till you can feel the spinal column quite distinctly, and you then find the uterus to be of normal size. The phenomena presented by that phantom tumefaction of the abdomen while the patient is being anæsthetized are very singular. When the patient lies down on her back, and the abdomen is uncovered, it is seen to be projecting, swollen, rounded, and defined, like the abdomen of a pregnant woman; but generally, as I have said, with an appearance of unusual constriction around the lower edge of the ribs. No change occurs during the first stage of the administration of the anæsthetic, and until the period of excitement has passed over, the swelling continues, and the muscles remain rigid and tense as at first; but gradually, as that stage passes off, and the respiration offers to become sonorous, the muscles begin to be drawn in, and the abdomen slowly flattens, until it assumes its proper size, or even becomes depressed and relaxed, like the abdomen after delivery. So long as the patient remains in a deeply anæsthetic state, you can make the most complete and satisfactory examination of the state of the uterus, and, indeed, of all the abdominal organs; and you may have recourse to this expedient with perfect safety and success in doubtful cases of real pregnancy also. But when she comes out of her sleep again, in a case of spurious pregnancy, the muscles begin to arch up and to become tense as before, so that by the time the patient is fully awake the abdomen is as large and rounded as ever, and the necessary examination becomes painful. For, as I have already hinted, the patient has sometimes in pseudo-cyesis a degree of tenderness in the abdomen that renders her very intolerant even of a slight amount of pressure. The patient having wakened up and found the apparent tumor still present, fails herself to be convinced of the fact that it had, for a time, been dispelled. But you may, perhaps, convince some of her friends of the absence of any real tumor, and their corroborative assertion may go far to bring her to a sound and proper belief afterwards. I had once a poor peasant's wife, from Berwickshire, with a spurious pregnancy, who bothered all her friends, and kept them in a state of continued anxiety and trouble, because she was always going into labor, until she had arrived at a period which corresponded in her reckoning with the thirteenth month of utero-gestation. She was one of those persons whom it was utterly impossible to convince by any argument of the true nature of her affection; and her great confidence in the reality of her pregnancy had imposed on her friends, and led them for a long time to share in her kind of monomania—for, after all, the mind is really in such a morbid state in some of these cases as to deserve the name of monomania. Having put her under the influence of chloroform, I called her sister into the room, and made her feel the spine through the collapsed abdominal walls, and succeeded thus in demonstrating to her entire satisfaction that there was no child in her sister's abdomen. But the patient waking up, and finding no change in her condition and form, might have remained unshaken in her belief, and, indeed, was still for stoutly affirming that she was pregnant, when her sister shut her up with, "Haud your tongue, woman! You've naething in your wame, for I felt your backbane myself with my ain hand!" I have no very satisfactory explanation to offer you of the nature of this very strange abdominal swelling, and of the peculiar phenomena observed in it, when the patient is in a state of anæsthesia. Some years ago I made a number of observations on some of our hospital patients to try and solve the difficulty. Some medical

friends, who had been told of the remarkable effect of the chloroform, were quite certain that the swelling must have been due to distension of the bowels with gas, which, they averred, must have escaped unobserved when the sphincter was relaxed during the deep sleep induced by the drug. But that this was not the proper explanation we easily proved by introducing a tube into the rectum, and putting the free end of it under water, and then finding that no bubble of air escaped during the anæsthetic subsidence of the swelling. I believe that the phenomenon most probably depends on some affection of the diaphragm, which is thrown into a state of contraction, and pushes the bowels downwards into the abdominal cavity. I am the more convinced that this is the true explanation, from the fact that you can sometimes make the abdominal swelling disappear for a second or two, by getting the patient to take a deep inspiration, and then suddenly breathe out again. But, whatever be the explanation, the value of anæsthesia as an adjuvant in aiding and establishing a correct diagnosis of such cases cannot be overrated.

CHAPTER XXV.

SPURIOUS PREGNANCY.—ITS PROGNOSIS, PATHOLOGY, AND TREATMENT.—*SIMPSON.*

THE last chapter was devoted, as you may please to remember, to the consideration of Spurious Pregnancy, or Pseudo-cyesis, a form of disease which, as I then told you, is in its more complete, but especially in its interrupted or fragmentary forms, by no means rare in practice, and ofttimes very puzzling to the practitioner. Until you have met with a model case, and perhaps been deceived by it, you would hardly believe how readily you might be led into the mistake of making a false diagnosis. To show you how far the deception may sometimes go, let me state that a lady came to me from the country a few days ago with pseudo-cyesis, and bringing with her a letter from her medical attendant, a highly experienced and intelligent practitioner, who writes me that all the symptoms of pregnancy were at one time very decided, and that he even made himself believe he heard the sounds of the fœtal heart on applying the stethoscope to the patient's abdomen. Such a mistake might easily be made by any of us, and the possibility of its occurrence may serve to impress upon your minds the importance of studying and making yourselves practically familiar with all the various means which are likely to enable you to obtain a clearer insight into the nature of the affection. In continuing this subject, now, let me say a word or two, first of all, as to

THE PROGNOSIS OF THE DISEASE.

Spurious pregnancy does not always run a defined and determinate course, and the period of its existence differs in different cases without our being able to assign any particular cause for the variation.

1. The symptoms may be all more or less fully established, and go on unintermittingly for a few weeks or months, and then suddenly break down and disappear. There is a cessation or abortion, as it were, in the course of the disease. In pseudo-cyesis among the unmarried, this is, perhaps, its most common mode of termination.

2. The symptoms may continue for the space of nine months, and the delusion that a real pregnancy is running its normal course may be kept up till the end of the usual period of utero-gestation, when the series of the phenomena of simulated pregnancy may be concluded by the development of the phenomena of simulated parturition; or, what occurs far more frequently, the disease may be brought then to a more or less speedy termination without the production of any such symptoms.

3. In some cases the train of symptoms goes on uninterruptedly even after the patient has passed the ninth month of her supposed pregnancy, and does not break up till she has reached the tenth, fourteenth, or eighteenth month. I saw a patient to-day who knows that she is laboring under spurious pregnancy, and who has felt movements which she supposed to be fœtal for fourteen months. There is another patient coming occasionally to my house at present with well-marked symptoms of spurious pregnancy, in whom I amputated the cervix uteri some twelve or fourteen years ago, and who since that period has never borne any children, but continued to menstruate regularly up to about eleven months ago. Nine months since she came to me believing herself pregnant, but as the uterus was quite empty and only somewhat retroverted, I assured her that she was not in the family-way at all. A month ago, however, she returned, averring that I must have been mistaken, because soon after the date of her previous visit she had begun to feel the movements of the child, which still continued very vigorous and distinct. She owned, certainly, that the movements were peculiar, and situated much higher up under the diaphragm than she had ever felt them in her real pregnancies, and on examination the uterus was found to be in exactly the same condition as it was nine months ago. Under the use of some of the remedies, of which I shall have to speak immediately, her symptoms have begun gradually to disappear. She is still inclined to aver that there is a child there, and that the child's movements are now lower down in the abdominal cavity, and she still retains a lingering expectation that she will soon be delivered; but her faith in the genuineness of the pregnancy has been materially shaken, and is slowly giving way.

4. The duration of the disease may not be limited by months, for the series of symptoms may continue and the delusion be kept up for years. I have seen patients living in the belief that they were pregnant, and deluding themselves with vain hopes for long periods, frequently making preparations for their approaching confinement, and still persisting in their belief after oft-repeated disappointments. I have seen the disease go on in this way till the patient's mind became unhinged and she became incurably deranged. There is a lady in an asylum in the neighborhood of this city who avers that she has inside her a child, which, according to her reckoning, must now have attained the age of at least ten years; and the last time that I had occasion to be in that institution I saw that lady, and was favored with the old announcement that she was to require my services very soon now. Such cases are, happily, extremely rare; but you do meet with them occasionally, and not in patients within the walls of a lunatic asylum only. It is told that a lady once came to Dupuytren to ask what was to be done in her case, as she had now been in the family-way for fourteen years—and the great Parisian surgeon gave it as his opinion, that as the boy must be tolerably well grown by that time, the best thing the lady could do was to swallow a tutor immediately, that his education might not be neglected!

PATHOLOGY OF THE DISEASE.

The question as to the pathological nature of this peculiar form of disease is still involved in great obscurity. On making a local examination of the organs of generation, with the expectation of discovering in them the source of all the other changes, we may find these organs in very different states in different cases.

First. We may find the uterus and ovaries affected by some common form of disease. Not unfrequently the uterus is felt to be hypertrophied and engorged; or may be in a state of anteversion

or retroversion; more frequently still, perhaps, there is some degree of ulceration; or some form of eruption on or around the os and cervix; or a slight degree of inflammation in the body of the organ. Or the ovary may be enlarged, or otherwise morbidly affected; as in one of the most perfect cases of spurious pregnancy I ever saw, where the series of symptoms seemed to have taken their origin in an abscess of the ovary. But,

Secondly. Far more frequently we find no trace of uterine or ovarian disease whatever, so that when we do meet with morbid states of the uterus and ovaries as complications of spurious pregnancy, we can hardly recognize them as essential causes of pseudo-cyesis, but must rather regard them as coincidences; and this all the more, when we recollect how common such diseases are among women who present no such sympathetic constitutional phenomena at all.

Thirdly. When observed in the lower animals, spurious pregnancy has been remarked to occur within a certain period after the time of heat, and to be distinctly connected with that condition; so that in them it is most probably dependent on the physiological change or changes which are at that time set up in the uterus and ovaries. Menstruation in the human female, as you know, corresponds to the phenomenon of heat in the lower animals; in as far, at least, as the process of ovulation and the ripening of a Graafian vesicle are concerned; and I believe that the aggregate of symptoms which we class under the designation of "spurious pregnancy" in women is in some way or other dependent upon the changes which occur in the ovaries and in the uterus at the period of menstruation. When the irritation associated with the normal or physiological changes in these organs is somewhat excessive either in degree or in duration, and is repeated from month to month, the sympathetic phenomena excited at one period have not had time, in some instances, to subside before a new stimulus is supplied for their continuation by the recurrence of the menstrual molimen. True pregnancy occurs when the ovulum which escapes from the Graafian vesicle duly meets within the mother's body with male spermatozoa, and, as a consequence, a long nine months' series of local and constitutional phenomena immediately begins to be set up. But the same series of constitutional phenomena, at least, is set up in cases of pseudo-cyesis when an ovulum escapes, or a reproductive nisus occurs, without any male spermatozoa being present; these phenomena occasionally ending, as we have seen, at the usual extreme term of utero-gestation, in a simulated parturition, or in a kind of *Lucina sine fœtu*, just as in some cases, as among the unmarried, they commence by a kind of *Lucina sine concubitu*, to borrow the language of the old physiologists. Experimental physiology, or experimental pathology, if you choose rather to call it so, might probably throw some light upon the subject. It is, at all events, extremely probable that careful observation of the phenomena of the disease as they occur in the lower animals, and a minute examination of the generative organs of some of them, which have been killed when in this state, might lead to the discovery of some appreciable and perhaps morbid condition of these organs which would serve to explain the peculiar phenomena of this disease. Perhaps we would find the *corpora lutea* under such circumstances, tending at least to simulate in their development and growth the *corpora lutea* of pregnancy. Pseudo-cyesis, let me again, in conclusion, repeat, though it may sometimes be found to be associated with, and to be exaggerated and continued by uterine or ovarian disease, yet it is not so necessarily or even most frequently; and, further, the local disease which is present may be of the most variable description. So that, on the whole, the disease would seem to depend rather on some disturbance of the ordinary function of the generative organs than on any organic disease of these organs attended and attested by organic changes in their intimate anatomical structure.

TREATMENT OF THE DISEASE.

But although, as pathologists, our knowledge of the nature and causes of pseudo-cyesis is so very limited and so very vague, as practitioners, fortunately, we can do a great deal towards moderating the symptoms and modifying or arresting the course of the disease. For in almost every case there are some indications for treatment clearly presented to us, and by skilfully fulfilling these, we can often succeed in cutting short and dispelling the whole of the phenomena. The principal indications which we require to look to are the following:

I. *Raise or Restore the Standard of Health.*

You will find that many of the patients affected with spurious pregnancy are in a state of impaired general health; and, independently of the nausea and vomiting which form part of the special symptoms requiring special treatment, they frequently suffer from indigestion, and are often very hypochondriacal. When such is the case, you will give material aid to the action of more specific remedies, and do much towards the cure of your patient, by the administration of bitter vegetable infusions, and of such tonics as may seem to you to be best fitted in each particular case to increase the general tone and vigor of the patient's constitution.

II. *Counteract or Cure any existing Uterine or Ovarian Disease.*

Though this indication may not require to be fulfilled in the majority of cases of spurious pregnancy, seeing that in most you find, as I have said, no disease of the uterus or ovaries at all, yet when such diseases are present, it becomes a matter of paramount importance to employ all the usual remedies adapted for their cure; and that not because these diseases are of themselves sufficient to lead to the development of spurious pregnancy, but because the irritation they excite in the generative organs, plays an important part, if not in the production of that malady, at least in its continuance, and must be counteracted and controlled by all appropriate means. When the os uteri is ulcerated, we must promote the healing of the sore by the ordinary means and applications; when the organ is inflamed acutely, or as it more frequently is, subacutely or chronically, we must apply leeches and counter-irritants, and employ the various antiphlogistics; and so on with all other forms of disease of the uterus or ovaries that may happen to complicate any particular case.

III. *Administer Uterine and Ovarian Sedatives.*

Perhaps the most important indication that presents itself for fulfilment in every case of pseudo-cyesis, is to diminish or dispel the irritation which we suppose in almost every case to have been set up in the uterus and ovaries, and which we believe to be the immediate exciting cause of all the other phenomena of the disease. Where this irritation is produced by, or connected with, any recognizable morbid condition of the organs of generation which is amenable to treatment, you must, as I have just stated, have recourse to all the usual remedies for the cure of that morbid state, in the hope that as the local disease is cured the symptoms of pseudo-cyesis may subside. But where there is no form of appreciable organic change to be detected, as is the case, I again repeat, in the greater number of instances, and where there seems to be merely some functional disturbance attended with irritation or excitement of the uterus and ovaries, then you must have recourse to the use of remedies which are likely to act as direct sedatives of the generative organs. But you may ask me, Have we any such remedies? To such a question I am inclined to reply by stating that I believe we have remedies of the kind indicated in the bromide and the iodide of potassium. I know, at all events, that by the administration of these drugs, and particularly by the administration of the bromide of potassium, I have often succeeded in cutting short the disease, and in causing the train of symptoms to be suddenly broken down, after they had been in existence for a few months only, instead of allowing them to go on and annoy the patient till the completion of a period corresponding to the usual term of utero-gestation, or even for a greater length of time; and this striking effect of these remedies I am disposed to attribute to some specific sedative action exerted by them on the uterus and ovaries. And

there are other facts known with regard to the use of these drugs, which go far to confirm the idea that they are possessed of such an action as I refer to. It is on this supposed action, for example, that Sir Charles Locock founds his recommendation of the bromide of potassium for the cure of epilepsy connected with menstruation. There is, as you are aware, a form of epilepsy which is liable to attack females, and more particularly young girls who have just reached the age of puberty, and who become subject to an attack of epilepsy immediately before, during, or after the recurrence of every menstrual period. The onset of the epileptic fits seems to be directly connected with some obscure kind of irritation set up at these periods in the organs of generation; and according to the experience of Sir C. Locock and others, this type of disease, which rarely yields to any other mode of treatment, may sometimes be cured by the use of bromide of potassium, which probably acts by quieting the excitement of the uterus. From these and such like observations as to the action of the bromide of potassium on the uterus, I was first led to try the effect of it in cases of spurious pregnancy; and from what I have seen of its efficacy in these cases I can recommend you very strongly to have recourse to its administration. Give five or six grains of it three times a-day, either alone, or with the addition of from two to three grains of iodide of potassium, and I feel certain that you will often succeed in checking the progress of the morbid symptoms, and so in relieving your patient's mind of much anxiety, and in saving her much needless trouble and prolonged distress. The remedy, let me add, has this further recommendation, that it often proves a good tonic, so that its use is not contraindicated by any constitutional debility on the part of the patient. The bromide of potassium, let me add, may also be applied locally to the uterus by having it made up in the form of a medicated pessary, and its action may then be aided or supplemented by the admixture of some other sedative, such as morphia or belladonna. Or you may employ other local sedatives. Thus I have sometimes attempted to allay uterine irritation in such cases, and more particularly where it was attended by, or amounted to, a certain degree of neuralgia, by the introduction of a stream of carbonic acid gas, or of that gas combined with the vapor of chloroform, into the vagina, in the manner I explained to you when treating of the palliative treatment of carcinoma of the cervix uteri. Sometimes, also, I have used leeches locally with a similar view. By the mere application in this way to the uterus of local sedatives you can never, perhaps, expect to produce such a powerful effect on that organ as will lead to a cure of the disease; but I believe you will often find them most useful adjuvants to the internal remedies. But besides attempting to arrest the whole train of morbid phenomena by this kind of radical treatment, there remains, finally, one more indication to fulfil, for you will be obliged in most cases to try more or less to

IV. *Reduce and Relieve the Individual Symptoms.*

The two symptoms which chiefly call for treatment in the course of the disease, are, first, nausea and vomiting, which are often as persistent and prostrating in cases of spurious as in cases of genuine pregnancy; and, secondly, tympanitis, which often gives great annoyance from the persistent attendant increase in the size of the patient.

a. Treatment of the Nausea and Vomiting.—The sympathetic sickness and vomiting of real pregnancy are, as you know, sometimes, though happily very rarely, so alarming and unmanageable as to oblige us to sacrifice the existence of the embryo to save the life of the mother by procuring abortion. Yet our treatment of symptoms which are thus occasionally so distressing and formidable, is in every instance of an altogether empirical nature, and when the same symptoms occur to such a degree as to call for treatment in any case of spurious pregnancy, they must then also be met by means which are purely empirical. It is just possible, indeed, that if by the application of leeches to the uterus and counter-irritants to the sacrum, aided by the employment of various antiphlogistics, we succeed in subduing some coexisting metritis—or if, by other appropriate means, we effect a cure of any other coexisting disease of the uterus—our treatment may, at the same time, have the effect of subduing the concomitant sickness. Or the internal administration of bromide of potassium may, perchance, fulfil at the same time the double indication of diminishing the uterine irritation, and dispelling the sympathetic nausea and vomiting. But where this combination of secondary symptoms, namely, nausea and vomiting, really occurs to such a degree as to prove distressing to the patient, as it not unfrequently does, it then demands some specific treatment, and, if one or two methods fail, you may require to put the patient through a course of many different medicines, and to ring the changes on all the drugs that are usually found to act most powerfully and certainly as sedatives of the stomach, before you meet with ultimate success. Sometimes you can moderate and remove this sympathetic nausea and vomiting by regulating the diet of the patient with some degree of strictness, and especially by giving food in small quantities and often, instead of loading the stomach with a large meal, and desiring her to take everything cold, or even iced. External counter-irritation over the stomach is prescribed by some physicians, and others advise us to apply morphia, etc., to such a surface when the cuticle had been removed by blisters. The internal remedies which are used for allaying nausea and vomiting, whether these phenomena be secondary and sympathetic, or directly due to some disease or disorder of the stomach itself, form a class comprising many and very different drugs; but from their very number and variety you may learn how uncertain each one of them is, and how frequently you may be baffled and obliged to try one after another before you succeed in relieving your patient. You can rarely, if ever, tell at first what remedy will prove successful in any particular case, and you must be prepared, when disappointed with the effect of one, to have recourse to the administration of some other form of sedative.

In many cases you will very naturally have recourse, in the first instance, to the use of that most generally efficacious of sedatives—opium. You may administer it, for this purpose, in any of the multitudinous forms of the drug, but always in very small doses corresponding to a fourth, a third, or a half of a grain of the solid opium. It may be given alone; and, perhaps, no form of it is more convenient or more agreeable to the patient than solid opium in the form of a very small pill; or it may be given in the form of powder combined with some other simple sedative such as the subnitrate of bismuth, or that other preparation of bismuth which is now coming into fashion, and which is supposed to be more certain and speedy in its action, inasmuch as it is more easily soluble in the juices of the stomach—I mean the carbonate. But there are many patients with whom opium in every guise and in every combination disagrees, and its use is here attended with this further drawback, that it tends to produce or keep up constipation of the bowels, which is one of those symptoms which you are called upon to control. The vomiting may often be checked and the nausea abated by the administration of one or two drops of prussic acid given in a teaspoonful of water, or in some syrup. When other means have failed, you may sometimes succeed in fulfilling the same indication by the use of two or three drops of naphtha, administered, perhaps, in a teaspoonful of the tincture of hops, which is certainly a very disgusting mouthful, but sometimes apparently of essential service in different kinds of vomiting. The chief objection to the use of this remedy is its disagreeable taste; and this objection holds good also in the case of creasote, another supposed potent and kindred anti-emetic. In administering any of the remedies to which I have referred, you will do well to combine them occasionally with some of the ordinary carminatives, with the view at once of obtaining the effect of that class of medicines, and of covering the unpleasant taste of the special remedy. A less disagreeable agent, or rather, one whose use is positively pleasant, is carbonic acid gas, which is frequently efficacious, and which is always easily procurable. The only caution to be observed in its employment is that you must give it in moderate quantities, and not to such an amount as to produce over-disten-

sion of the stomach. You have it always at hand in champagne, soda-water, and the various aerated drinks, or you may order it in the form of an old and celebrated remedy once very extensively employed and known as the anti-emetic "potion of Riverius," which was a draught composed of a solution of a scruple of salt of wormwood (or carbonate of potass), mixed with a tablespoonful of lemon-juice. Effervescing wines are sometimes useful in small doses, both as containing carbonic acid, and as gentle stimulants when the latter are required. Again, you will find that swallowing frequently small pieces of ordinary block ice is often of very great avail in checking vomiting and allaying sickness; and I would recommend you in particular to have recourse to this remedy whenever the patient is at all feverish, or when she suffers from thirst. Salicine is at present, I believe, a favorite remedy with some English physicians, and is frequently prescribed with success, in the form of a pill, powder, or solution, containing two or three grains of salicine to be taken three or four times a day. From the class of metallic bodies we derive a number of remedies which are of essential service in cases of sympathetic vomiting. Such are the nitrate and oxide of silver, which, as well as the preparations of bismuth to which I have already alluded, have long been regarded and employed as amongst the most valuable agents we possess in many forms of the affection. In acetate of lead you have another therapeutic agent of occasional value as an anti-emetic, although it is more known and esteemed for its many other important medicinal virtues, than for the property which it possesses of allaying irritability of the stomach and sympathetic vomiting. Some fifteen or sixteen years ago I saw a case, in consultation with the late Dr. Abercrombie and Dr. Argyle Robertson, where the patient, who was in one of the early months of pregnancy, suffered from vomiting to such a degree that she was utterly prostrated; and at last it was thought we should be compelled to induce premature labor, or rather abortion, to save her life. But on the suggestion of Dr. Abercrombie it was agreed, before having recourse to this extreme measure, to make trial of the effect of acetate of lead, which was almost the only drug of the class that had not been administered, and, to our great delight, the result of the trial was that the vomiting was immediately restrained and finally checked by the administration of the drug. You may never be obliged to make such an application of this agent; but lest occasion for it should arise, it will be well for you to bear in mind this property of it. I have never seen the vomiting of pregnancy, whether real or spurious, assume the form of hæmatemesis, and I believe that such is an extremely rare occurrence; but I am certain you will excuse me, even although it may thus appear somewhat foreign to the subject in hand, if I take occasion here to inform you of the very striking and satisfactory effect which I lately witnessed from the use of a solution of perchloride of iron in glycerine in a case of vomiting of blood. The patient, whom I saw in consultation with my friend Dr. Andrew Wood, had been vomiting up great quantities of coagulated as well as fluid blood, and a great many different remedies had been employed, but without any good result. Having had frequent experience of the effects of the local application of perchloride of iron in arresting hemorrhage, I proposed that some should be introduced into the stomach, in the hope that by coming into contact with the blood at the vascular orifice, or orifices rather, from which it was escaping, it might lead to its coagulation there, and so prevent its further flow. Accordingly, after a severe fit of vomiting, by which the stomach seemed to be for the time emptied of its contents, the patient was made to swallow a teaspoonful of the concentrated solution of perchloride of iron in glycerine, and from that hour to this, now several weeks ago, she has had no return of the vomiting. You need have no fear, I believe, of any bad consequences from the use of this remedy; at least, I know from experience that a much larger dose than that which I have indicated may be given with perfect impunity. For having had occasion once to carry to a patient's hotel some of the liquid to apply to leech-bites on the cervix uteri, which happened to bleed for an unusual length of time, I left the bottle of the liquid in the patient's room to use if the bleeding recurred. The lady's husband was at the time absent, but being an Englishman who believed that the prime duty of every practitioner was simply and purely to administer drugs, when he came in and was told that no medicine had been given, but that the doctor had left a bottle behind him, he savagely insisted on making his unfortunate wife swallow all its contents, about two ounces of perchloride of iron solution. I was horrified when I heard of what had been done; but as it turned out, my alarm was groundless, for no bad effect whatever ensued, except that the walls of the patient's mouth felt for a time mercilessly puckered and pulled together.

I have thus named to you a variety of remedial agents, all of which, whether singly or combined, are more or less efficacious for the cure of vomiting; but I have not as yet said anything regarding the drug, which I have found to be, of all individual remedies, the simplest and surest agent that can be administered for arresting the sympathetic vomiting of pregnancy. The drug I refer to is oxalate of cerium, which I have seen successful in curing vomiting in a larger proportion of cases than any other single remedy which I have used; and its good effects are not confined to the forms of vomiting which depend on the sympathetic derangements of the stomach caused by changes, functional or pathological, in the uterus or other organs, but are manifested also in those forms of the disease which are due to different morbid conditions of the stomach itself. Cerium is, as you know, one of those rare and little known metals which were first discovered in the early part of the present century, and is found chiefly in the Scandinavian mines, combined in small proportions in various minerals. I believe that any of the other preparations of the metal would fulfil the indication equally as well as the oxalate, which is used simply because it is the most easily procurable salt of cerium in the market; oxalic acid being used to separate the cerium from the metal with which it is most generally combined in nature, namely, didymium. The action of cerium on the stomach seems to be that of a sedative tonic, resembling in some degree the action of the salts of silver, and bismuth; and I have seen it succeed in curing the most obstinate cases of vomiting so much oftener, and so much more speedily than any other remedy, that I have come of late to have great faith in its employment. I would not lead you to suppose that by the administration of a quantity of oxalate of cerium you will succeed in curing every case of vomiting, or even in alleviating it in every case; but I am certain that you will find the remedy successful in a larger majority of instances than you will find in any other one drug. You may give one or two grains of it, three times a day or oftener, in the form of a pill, or mixed with a few grains of gum tragacanth, in the form of a powder. The vomiting usually ceases after a few doses have been taken; but in some cases it does not abate till the remedy has been persevered with for several days. The effect is sometimes instantaneous. I had a patient some time ago from the west of Scotland, and when her husband first came to ask me to visit her I was engaged and could not go, but after hearing his account of the case, I gave him a prescription for cerium pills, which I desired him to administer to his wife till I could get to see her. He came back next morning, asking what the medicine was which I had given him, for the effect of it had been like magic. The vomiting, which had been going on almost incessantly, and which nothing seemed to have any power of alleviating, ceased upon the administration of two doses of the cerium. In a previous pregnancy in this patient it had been made a question for a medical consultation whether abortion should not be induced, to save her from the effects of uncontrollable sickness and vomiting. But the good result is, unfortunately, not always so immediate.

One of the earliest cases in which I employed it was in the case of a lady who came from Greenock, when she was pregnant for the fourth time, and had arrived to between the third and fourth months of gestation. For these three or four months she had been always vomiting many times a day, and often during the night also; and that whether the stomach was empty or full. She could take but very little food, for she always sickened at the sight of it.

It had been the same in all her former pregnancies; and on the occasion of the first of them the vomiting was so severe as to bring on a miscarriage, and the patient's own life was despaired of. She got, first of all, one grain of oxalate of cerium, but vomited three hours afterwards. She was then told to take a grain every three hours for a day, and afterwards one grain thrice a day. This was successful in checking the vomiting, and a few days afterwards she left Edinburgh, feeling quite well, eating her meals heartily, and free from all sickness. Everything had been tried by different medical men in the West which afforded any prospect of relief, as creasote, prussic acid, bismuth, lime-water, ice, champagne, opium, blisters, etc., but all without effect. The only thing from which she ever experienced any benefit, and that was only very transient and temporary, was calcined magnesia. Yet, as I have told you, it requires only a very few doses of oxalate of cerium to produce a perfect cure. Shortly afterwards I saw with Dr. Craig, of Ratho, a case of severe and persistent vomiting in pregnancy, where he had tried everything; but in vain. She, too, was cured by a few doses of cerium. When the propriety of entering this and other modern remedies in the new Pharmacopœia to be published by the Medical Council was lately debated, it was objected that so little of the drug is used that it is not worth while classifying it among the other recognized medicinal agents. But on making inquiry lately at the drug shop of Messrs. Duncan, Flockart & Co., in this city, I was told that they had sold as much as sixty-four ounces during the preceding twelve months, and I feel assured that it only requires to be more widely known to make it more extensively esteemed and employed as a general metallic sedative tonic. But it is time that I should proceed to say a word or two as to the

b. Treatment of the Tympanitis.—The enlargement of real pregnancy will be borne by most patients without repining, whereas the distension of the abdomen which forms one of the most deceptive and striking symptoms of spurious pregnancy is a source of constant complaint; and you will frequently be called upon to do all in your power to relieve it. Although the phenomenon is in a great measure due, as I have already endeavored to explain to you, to a peculiar action of the diaphragm, as is shown by the flattening of the abdomen, which is seen when the action of the muscles is modified by the influence of anæsthetics; yet there is in most cases a physical cause which operates in some degree towards the production by continuance of the protuberance, and which you can, in some measure, overcome by means of medicaments—I mean, of course, flatulence. For this a variety of remedies may be employed, and perhaps there is none which you can use with more success than the ordinary compound galbanum pills of the Pharmacopœia, of which the patient should be made to take two, twice or thrice a day. Some physicians have faith in these cases in pills of ox-gall. The assafœtida pill is sometimes of great service, more particularly in those cases where hysterical symptoms are superadded. Some of the valerianates, such as the valerianate of zinc, may be administered with much advantage. Powdered charcoal used to be a favorite remedy with the late Dr. Abercrombie in many forms of flatulence; and a teaspoonful of that powder administered three or four times a day often reduces the swelling more rapidly than anything else, more especially in those cases where there is much flatus present. It acts probably in consequence of the well-known power which charcoal possesses of absorbing great quantities of different gases. Where there is any degree of irritability of the intestinal mucous membrane, it may be very advantageously given in combination with bismuth; and, perhaps, some calcined magnesia; but the most elegant form in which charcoal can be administered is the charcoal biscuit which is sold by most chemists and druggists. In addition to other means, you will sometimes find it advisable to make the patient wear a binder applied pretty tightly round the abdomen, to afford support to the abdominal walls, and to assist by its pressure in causing absorption of the intestinal gases.

CHAPTER XXVI.

STERILITY.—*HEWITT.*

THERE is hardly any pathological condition of the generative organs of the female which may not, directly or indirectly, have to do with sterility; and it is very certain that no individual will be able to form a sufficient diagnosis of the causes of sterility in a given case, who is not familiar with the whole range of knowledge in this department of medicine, and who is not further intimately conversant with the anatomy and physiology of the generative organs. It would appear that in reference to the diagnosis of the causes of sterility, practitioners have not uncommonly failed in detecting the cause, simply because they have not taken a sufficiently wide and comprehensive view of the subject; and it has not unfrequently happened, in consequence, that in cases of sterility where the cause was very readily removable, the cause has been overlooked because it has not been sought for. Individuals, for instance, have been long and fruitlessly subjected to courses of hygienic and general treatment for the cure of sterility in cases where a very simple exploration of the generative organs would have shown the futility of such treatment. But while the causes of sterility are such as in many cases we can detect, explain, and remove, there are not a few cases in which our attempts are baffled, and for the solution of which we must be content to await the further advance of knowledge.

It need not be stated how important it is in many cases that are likely to come before us that we should be able to resolve the question—What is the cause of the sterility? The reproach of childlessness is one which is often a very grievous one to bear, and one which the patient would often give her all to remove. There is then a double inducement to the careful study of the subject—its inherent difficulty, and the importance of overcoming that difficulty.

The only practical method of treating the subject of the diagnosis of the causes of sterility is to state definitely and systematically what are the possible causes. The following list of these possible causes has been made out chiefly on the basis of facts actually observed and recorded.

The question which naturally first occurs to us in ascertaining the cause of the sterility is—To whom is the infertility to be attributed, the woman or the man?

If the male organs be intact, and questions with reference to power of erection and penetration be answered satisfactorily, the question, What is the cause of the sterility? may generally be dismissed as far as the husband is concerned. The cases are few in which, if the testes be apparently sound, the secretion itself is deficient in fertilizing power. * If the husband be in good health, and have lived temperately, the power of impregnating often exists up to a very advanced period of life; but in those who have, from

* Mr. Curling contends that in the man an inaptitude to impregnate may coexist with the capacity for sexual intercourse—that, in fact, the man is subject to *sterility* independently of virility. The microscope has been occasionally employed with the view of ascertaining the presence or absence of spermatozoa in the seminal secretion, and it is asserted that they have been found absent in some cases of sterility. See Dr. Marion Sims's work on Sterility.

an early period of life, been addicted to excesses, the sexual power may fail prematurely. In cases of the latter kind, inquiries will readily show the nature of the deficiency.

The first point to which our inquiries tend is as to the patency of the canals through which the spermatic fluid and the ovule must pass in order to come into contact. The vagina, the uterus, the Fallopian tubes, must offer no impediment, or sterility is inevitable.

We may consider the causes of sterility in the woman under the following heads: 1. Mechanical causes; Abnormal condition of some part of the generative passages, such as to interfere with the proper transit of the spermatic fluid or of the ovules; 2. Abnormal conditions of the secretions of the generative passages; 3. Constitutional and general causes.

1. MECHANICAL CAUSES OF STERILITY.

a. Abnormal Conditions of the Hymen.—This membrane is sometimes dense and firm, and effectual intercourse is prevented. Cases in which this condition is met with usually come under our notice owing to a complaint on the part of the husband that intercourse cannot be effected satisfactorily. In some such cases we find on inquiry that the menstrual flow proceeds regularly and without much apparent disturbance; the hymen is not quite complete, but is perforated at one or more points sufficiently to allow of the passing of the menstrual fluid, but not sufficiently so to allow of perfect intercourse. In such cases, sterility generally, but *not always*, exists; for it has been found in cases very well authenticated, some of which may indeed be found in Mauriceau,* not to cite authorities much more recent, that a nearly perfect hymen does not necessarily prevent fecundation. In some of these cases the hymen has been found so dense and firm at the final termination of pregnancy, as actually to impede parturition. Thus the menstrual phenomena may be present, and yet the hymen may be imperforate in a certain degree. In another class of cases the woman has never menstruated, and the hymen is found complete, absolutely preventing the escape of the menstrual secretion. In some rare cases the hymen is imperforate, but is at the same time yielding, so much so, indeed, as to allow of ordinary intercourse. A case in which the hymen is absolutely imperforate generally arrests attention from the fact that the menstrual flow has never been observed, and, in the case of married women, the aid of the practitioner is more frequently called in for this reason than because of the sterility with which it is also associated. The physical examination will always and readily demonstrate the nature of the impediment to fecundation which exists in both of these important classes of cases.

b. Narrowness or partial Closure of Ostium Vaginæ or Vaginal Canal.—The vagina is in rare instances *partially closed* at different parts of its course by bands, constituting partial strictures of the canal, and rendering intercourse difficult or incomplete, and so leading to sterility. Such a condition of the canal may be congenital, or it may be brought about in consequence of previous difficult parturition, laceration and cicatrization of the torn part leading to contraction, and to partial, or even complete, closure of the canal. The strictures thus resulting may be low down, at the position of the hymen, or higher up nearer the os uteri.

c. Or the vagina may be *altogether absent*, or constituted by a small cul-de-sac, barely admitting the point of the finger. This condition may be congenital, or may be produced by difficult labor, laceration of the walls of the canal having been followed by cicatrization and contraction of the same. In the congenital variety, menstruation is absent because of the usually associated absence or defective development of the uterus; in the acquired variety, menstruation may or may not be absent according as the canal is completely closed or not. The canal may be large enough to allow of menstruation occurring, but too small to admit of sexual intercourse, and consequently of impregnation.

* Maladies des Femmes.

d. Tumors, etc., interfering with Sexual Intercourse.—The aperture of the ostium vaginæ being natural in point of size, sterility may exist because of the presence of a tumor or growth filling up the canal, or so situated as to interfere with efficient sexual intercourse. The presence of an *enlarged clitoris* has been known to have this result.

The canal of the vagina may be occupied by a growth interfering in like manner with intercourse. *Hypertrophy of the cervix uteri* forming a conical tumor sometimes of considerable size, *polypus of the uterus* hanging down into the vagina, or *prolapsus* of the uterus itself, may in particular cases give rise to sterility.

e. Spasmodic Affection of the Ostium Vaginæ—Vaginal Spasm—Vaginismus.—This condition has until recently had hardly a sufficiently prominent place assigned to it in the list of causes of sterility. Its relation to sterility is a very important one. Recently it has excited the attention of more than one observer—Debout, Michon, Marion Sims. The affection has been described in some of the older established text-books. The spasmodic contraction is induced or aggravated by attempts at sexual intercourse. Owing to the extreme sensibility of the parts in the first, and to the mechanical closure of the canal in the second place, sexual intercourse is almost or quite impossible, and there is consequently sterility. The nature of the affection has been discussed in a previous chapter.

f. Condition of the Uterus.—Absence or imperfect development of the uterus is a cause of sterility the existence of which is only to be substantiated by an internal examination. There is a class of cases which come under the present category, and which are very interesting from a practical point of view, viz., those in which the cervix uteri, or rather the vaginal portion of the cervix, is small and somewhat infantile in character, the opening being also small. In many such cases infertility has been observed, and has been remedied by simply incising the os uteri and thus enlarging the aperture.

Infertility is by no means a necessary consequence of absence of the catamenia. It has been repeatedly proved that women may conceive who have never menstruated; and if it became a question whether marriage was allowable in a particular case, the simple absence of this function could not be considered as *definitively* against the propriety of such a procedure, unless that absence were accompanied by other and more essential sexual deficiencies.

The other conditions on the part of the uterus which may cause sterility will next be enumerated. First are to be considered those cases in which the cavity of the uterus is occupied by tumors—*polypi* of the uterus. They produce sterility in two ways: first by closing the canal of the uterus and preventing the contact of the spermatic fluid with the ovule; and secondly by determining the speedy ejection of the young ovum in cases where impregnation has actually occurred—in other words, by producing abortion at a very early period.

The presence of a polypus, even of a somewhat considerable size, in the uterus, does not necessarily produce sterility. *Fibroid tumors of the uterus* are effectual both in the production of abortion and in the actual prevention of impregnation; when the tumor is situated between the uterine mucous membrane, and encroaching gradually on the uterine cavity, producing a narrowing or partial occlusion of the cavity of that situation, impregnation is prevented. Out of 69 cases of fibroid tumor recorded by Scanzoni, 35 had never conceived. According to my own experience, fibroid tumors generally altogether prevent conception.

Chronic hypertrophy of the uterus, variously termed, also, chronic inflammation of the uterus, "chronic infarctus," is a condition unfavorable to fecundity. Scanzoni attributes the sterility of prostitutes to the existence of this alteration. This condition is generally accompanied with congestion and undue fulness of the neighboring blood-vessels, alike unfavorable to healthy ovulation and to the normal development of the ovum within the uterus.

That form of atresia produced by *flexion of the uterus* is, I believe, by far the most common cause of sterility. The flexion produces

sterility because it prevents the passage of the seminal fluid into the interior of the uterus. The causes of dysmenorrhœa and of sterility are often the same. Hence a close study of the causes of dysmenorrhœa is essential to the understanding of this subject. The frequency with which anteflexion of the uterus is associated with sterility is very great.

The *uterine cervical canal* may be *comparatively very narrow*, the seat of the constriction being either at the upper extremity of the cervical canal, where it joins the body of the uterus, or lower down at the os uteri. And there may be *congenital closure* of the canal at the positions indicated. In cases in which there is actual closure of the canal, the os uteri being imperforate, menstruation is of course absent, and there may be menstrual retention. In cases where there is an opening, but a small one, the symptoms present are, speaking in general terms, those of dysmenorrhœa. The opening is often small, owing to flexion and consequent valvular closure, but when the os is drawn down, and the canal straightened, the sound enters readily enough.

Conical, or flexed, or elongated condition of the vaginal portion.—Dr. Marion Sims insists, and I believe correctly, on the influence exerted by an abnormal condition of the canal at its lower portion in the production of sterility. The vaginal portion is sometimes too long, and when this is the case it has a tendency to become curved. This curvature (of the portion of the canal within the vagina, be it understood) is sometimes so great that the long tapering cervix is almost doubled on itself. The patency of the canal is thus seriously interfered with, and it is important to bear in mind that dysmenorrhœa is not necessarily associated with flexion of the canal at this point. The vaginal portion should have a certain length, shape, and direction, and a deviation in either of these particulars may lead to sterility.

Valvular closure of the os.—This condition arises when one of the lips of the os uteri is considerably larger than the other. The os has then a crescentic shape, and the orifice is virtually less than it should be. Sterility may be associated with it.

The os uteri sometimes *becomes closed*, and sterility arises in consequence of the opposite sides of the canal becoming adherent after being torn. This is now and then a consequence of labor. In some cases it has been produced by the incautious or improper use of caustics.

Chronic inflammation and induration of the cervix of the uterus are causes of sterility: the opposite sides of the os are hard, firm, and the opening actually very small, although it may appear to be large. The canal is frequently distorted, and the opposite sides actually touching each other. The sound enters readily, but there is nevertheless less patency of the canal than there should be.

In cases of *dysmenorrhœa* attended with expulsion of a membranous structure at each menstrual period, sterility is very generally observed.

g. Diseases of Ovaries.—Cystic or other tumors of the ovary prevent conception in many cases where menstruation is still present; but the existence of disease in one ovary, or removal of one ovary by operation, is not incompatible with the occurrence of pregnancy. Disease of the ovaries interferes with the fecundity of the woman in two ways: directly, when the due secretion of ovules does not occur, and consequently either no ovules, or ovules in a morbid condition, are conveyed into the Fallopian tubes, in which case, however, menstruation would be expected to be absent, or at all events much disturbed; and indirectly, when the pressure of large tumors of the ovaries dislocates the uterus, and so disarranges the natural relations of this organ as to prevent both the passage of the ovule downwards and the entrance of the spermatozoa into the uterus; or when the dislocation in question leads to the ejection of the latter from the uterus at a very early period of its development. Careful physical examination of the abdomen and of the pelvic cavity through the vagina is necessary to exclude ovarian disease from the consideration.

h. Altered conditions of the Fallopian tubes may prevent the passage of the ovule into the uterus. Peritonitis occasionally produces such *adhesions of the peritoneum covering the pelvic organs* as to render it physically impossible for the ovaries to be grasped by the fimbriated extremities of the Fallopian tubes; thus the "ovipont" cannot take place. *Atresia* or closure of the canal is a condition sometimes met with; a condition of course fatal to impregnation of the ovules from the corresponding ovary. This condition may be combined with *dropsy of the Fallopian tubes.* Fibroid tumors of the uterus occasionally produce occlusion of the Fallopian tubes.

i. Here may be mentioned a possible cause of sterility, important to bear in mind—*ill-timed sexual intercourse.* It is the fact that women have a much greater aptitude to conceive immediately after the cessation of the menstrual flow, and this, therefore, is the most favorable time for sexual intercourse. It is related that Catharine de' Medicis, wife of Henry II. of France, became pregnant after having been sterile for many years, apparently in consequence of following the advice of the physician Fernel, that sexual intercourse should only take place at the time in question.* It may turn out on inquiry, in particular cases of sterility, that it has been the custom to act in ignorance of this fact.

k. Under the next head may be included a number of causes occasionally, but by no means necessarily, leading to abortion. Thus cases in which *masturbation* is practised; cases in which sexual intercourse is allowed to take place *too frequently;* cases in which the vulvar aperture is the seat of disease, as in *follicular inflammation of the vulva*, are those coming under this category most deserving of mention. *Diseases of the rectum* have been known to be associated with sterility.

2. ABNORMAL CONDITIONS OF THE SECRETIONS OF THE GENERATIVE PASSAGES.

Leucorrhœa.—Under ordinary healthy conditions, contact with the secretions of the mucous membrane lining the cervix, the uterus, and the vagina, does not at all impair the vigor and activity of the spermatozoa, in which the power of fertilization resides; but these secretions may be so altered as to materially affect the activity of the spermatozoa, or so as to prevent mechanically, by their viscidity and tenacity (Dr. Tyler Smith), the passage of these bodies into the cavity of the uterus. The vaginal secretion is naturally acid; the cervical mucus is naturally alkaline; the healthy degree of acidity and alkalinity respectively is not hurtful to the spermatozoa; but it has been shown experimentally that if the vaginal mucus be too acid, or the cervical mucus be too alkaline, the spermatozoa subjected to the direct influence of these secretions quickly lose their power of motion. The relations of leucorrhœa to sterility have been fully discussed by some late observers, by Dr. Whitehead,† Dr. Tyler Smith,‡ and Dr. Marion Sims§ in particular; and each of these authors cites numerous cases of sterility associated with leucorrhœa, and in which there would seem to be little doubt that the influence of the leucorrhœa in producing the sterility was due in a great part to the existence of this morbid condition of the secretions.

Coste‖ refers to an anecdote related by Dubois bearing on the questions now under consideration. A lady who had been for many years sterile, informed Dubois that having been in the habit of always using an injection of cold water after sexual intercourse, she one day accidentally used warm water instead. The result was that, having been sterile for many years, she at last conceived. Coste ascertained by experiment that the spermatozoa of mammalia are prejudicially affected by the application of quite cold water, whereas the admixture of warm water with the seminal fluid rather promoted than not their activity. These facts have their importance. It is quite possible that mere increase in the quantity of the secretion poured out by the cervix uteri may interfere with impregnation; and as the presence of a certain amount of fluid on

* Montgomery, op. cit., p. 479.
† On Abortion and Sterility.
‡ On Leucorrhœa.
§ On Sterility.
‖ Histoire générale et particulière du Développement des Corps Organisés, tom. i., p. 55.

the surface of the mucous membrane would appear to be necessary for the proper conveyance of the fertilizing fluid, it is not unreasonable to suppose that, where the mucous secretions of the generative passages are deficient in quality, sterility may be observed.

3. CONSTITUTIONAL AND GENERAL CAUSES OF STERILITY.

One of the conditions here to be mentioned is, *sexual frigidity*—a want of inclination for sexual intercourse. There can be no question that the connection of this frigidity of temperament with sterility has been very much overrated. Women conceive and bear children who evince little or no sexual inclination. This condition is only *necessarily* associated with sterility when the generative apparatus is deficient and imperfectly developed; and no positive deduction can be drawn from such disinclination as to the incompetency of the woman to conceive.

When great *general debility* and *anæmia* are present, it is often the case that conception does not occur. The ovarian function suffers in common with the functions of the body generally, and the woman is not apt to the procreation of children. With anæmia disorder of the menstrual functions frequently, as is well known, coexists; the cases are few in which, menstruation being present, the sterility is dependent on the anæmia.

Another condition, the opposite of that present in anæmia, is more often the cause of sterility—that, namely, produced by *overfeeding* and *luxurious habits*. It is matter of common observation, that the laboring classes, amongst whom destitution frequently prevails, are prolific in a degree not witnessed in the higher ranks of society. "It is," said the late Dr. Marshall Hall, "incontrovertibly proved by Mr. Sadler, in his work on the Law of Population, that the fecundity of the human race is diminished by the indolent and luxurious mode of life prevalent among the rich, whilst it is augmented by the laboring habits and spare diet of the poor . . . the proportionate infecundity of the two being, in general terms, as 6 to 1." *

In women who are *unusually fat* an inaptitude to conceive is often observed.

Syphilis.—It is well known that the presence of syphilitic disease in either parent is frequently the cause of abortion or of premature birth. It may be questioned, however, whether the presence of syphilis is not occasionally the cause of sterility by destroying the product of conception at so early a period of the pregnancy that the very existence of pregnancy is for that reason unrecognized—the woman being really capable of conceiving, but the product of conception quickly perishing. The effect of syphilitic disease in disturbing the normal growth of the decidua at the commencement of pregnancy has hardly been, as yet, the subject of attention; but it is quite possible that disease of the decidua of a syphilitic character may come hereafter to be a recognized pathological condition. Facts which have come under my own observation have led me to suspect that syphilis may give rise to the effect here alluded to.

Conclusion.—In endeavoring to ascertain the cause of the sterility, it will be necessary for the observer carefully to examine into the history and antecedents of the patient, the manner in which menstruation is performed, and the general condition of the bodily health. Further, it will generally be necessary to examine the vagina and the external generative organs, and, if no cause for the sterility be there found, to examine the uterus. In carrying out the examination of the parts in question, the eye and the touch are both to be employed. In investigating the condition of the uterus, the speculum and the uterine sound, one or both, are required.

TREATMENT OF STERILITY.

The cure of sterility is dependent upon removal of the cause, whatever that may be, and the means of cure are necessarily almost as numerous as the causes. It is unnecessary here to consider these *seriatim:* the more so as the conditions leading to sterility frequently occasion other difficulties, dysmenorrhœa, etc., the treatment of which has been already discussed. In many cases the cure is impossible, in some instances a very slight mechanical treatment is all that is required, in a few, more elaborate surgical procedures are necessary, in order that the organs may be placed in conditions favorable to the occurrence of conception.

CHAPTER XXVII.

MODES OF INDUCTION OF PREMATURE LABOR.†—*SIMPSON.*

A VARIETY of means or plans have been proposed for the artificial induction of premature labor, in those various and important complications which are now so generally recognized by the obstetric profession as demanding this mode of operative interference.

Thus it has been attempted to excite the uterus into parturient action—1. By external abdominal frictions, so as to irritate its outer surface; 2. By passing currents of electricity or galvanism through its walls; 3. By irritating other, and even distant, parts or surfaces, as the vagina, rectum, or nipple, that are known to possess a marked reflex power over the contractility of the uterus; 4. By the internal exhibition of ergot of rye and other oxytoxic remedies; 5. By the evacuation of the liquor amnii; 6. By the dilatation of the os uteri; and, 7. By the separation of the membranes from the cavity of the cervix or body of the uterus by the finger, by instruments or sponges, or by the injection of fluids.

The first three of these modes of inducing premature labor are—alone and singly—so very uncertain in their results, and so generally and entirely fail, that few or no accoucheurs place any confidence in them; ‡ and to the fourth the same objection applies, with this addition, that the ergot, even when it has succeeded, has proved too dangerous in its effects upon the child to be used in an operative procedure, instituted, as this usually is, for the very purpose of saving the infant.

The fifth mode which we have enumerated above, viz., the evacuation of the liquor amnii, is, of all the methods proposed, both the oldest and assuredly the most sure and fixed in its effects. But, as a common means, and when labor is induced to save the infant, it is liable to one strong objection, viz., that it is undoubtedly much more dangerous to the child than the employment of operative procedures, which—as the dilatation of the os, or the separation of the membranes—allow the bag of membranes to remain entire, and

* On Constitutional Diseases of Females, 1830, p. 7.

† See Proceedings of Obstetric Society for 1844, 1845, 1851, etc.

‡ Several years ago I attended a case with Dr. Thatcher, in which we applied a child to the breast with the object of exciting pains. Some hours before, I had introduced a large sponge-tent into the os uteri. There was a wet nurse in attendance to suckle our patient's infant as soon as it was born. It was the nurse's child which we applied to the nipples; and, as she thought, with the effect of increasing the uterine contractions and pains, which had already begun to appear. I have never, however, seen such an application of an infant to the nipples *originate* uterine contractions, nor in the two or three cases in which I have tried the plan of Schoeller and Braun, of distending, and consequently irritating the walls of the vagina with masses of sponge or a dilating caoutchouc bottle, have I been at all successful in exciting the uterus to parturient action. I have not seen the abdominal frictions of D'Outrepont and Ulsamer tried.

thus keep the fragile and premature infant protected by the amniotic fluid during the progress of the labor, or at least during the earlier stages of it.

In by far the greater number of instances in which I have had occasion to induce premature labor in private and consultation practice, I have always, in the first instance, avoided the artificial evacuation of the liquor amnii, and have proceeded upon the principle either—I. Of dilating the cervix uteri, or, II. Of separating the membranes; or rather I have acted upon both of these plans conjointly, for it is difficult or impossible to follow out thoroughly the one indication without, in some respect at least, following out the other also.

I. DILATATION OF THE OS AND CERVIX UTERI.

In exciting premature labor upon this principle, accoucheurs have used three different means—1. The finger; 2. Metallic dilating forceps and instruments; and 3. Sponge-tents. To stretch, however, and open the os uteri by the finger or by metallic dilators is a process so irritating and painful, that few or no practitioners now use it; especially as the same object can be effected more easily and safely by the introduction of compressed sponge.

Sponge-tents were first proposed as a means of inducing premature labor by Kluge and Brunninghausen; and they have been much employed for the purpose both in Germany and France. All the continental accounts, however, of their employment, up even to the present day, describe the introduction of the tents into the os uteri as a complicated operation, requiring always the aid of the speculum, and the use of a vaginal tampon, or other means, to keep the tent in situ. But there is no necessity whatever for such formidable arrangements. In 1844, when first mentioning the induction of premature labor in this country by sponge-tents,* I attempted to show that they could be easily introduced and employed without any vaginal speculum or tampon, or in the simple mode already described in a preceding paper on Intra-Uterine Polypi. And for several years subsequent to that date, I had recourse to this mode of inducing premature labor in a long series of cases; always with perfect success as regarded the mother, in a large proportion of cases with safety also as regarded the child.

I never found this means fail, although in a few instances I have seen the dilatation effected to the size of a half-crown or more, for thirty or forty hours before true uterine contractions set in. Generally, however, parturient action began long before the dilatation of the os uteri had reached these dimensions; and when it did so, a considerable part of the first stage of labor was thus, as it were, found finished before actual labor commenced. Sometimes uterine pains and contractions began as early as four or six hours after the sponge-tent was introduced, especially if the tent were of considerable size, and means were used for its rapid development. In almost every case, the first tent employed may be as thick as the little finger; and the patient should be directed to have injected into the vagina every hour or two a small quantity of warm water for the imbibition and expansion of the compressed sponge. She should lie on the back during, and for some time after, each injection, in order that the water may be more thoroughly retained. After the first sponge is fully dilated, it may be withdrawn, and a second and larger one introduced; or, without removing the first, tents of a greater and greater size may be introduced at intervals of six or eight hours, till the os uteri is thoroughly dilated or labor supervenes.

To the induction of premature labor by the use of sponge-tents I have heard some accoucheurs object, on the ground that, from want of practice, they have had difficulty in introducing the compressed sponge into the os uteri. A much more important drawback to the method will be found in the circumstance that the presence of a large sponge-tent in the canals of the cervix uteri and vagina, sometimes, as a foreign body, produces such a degree of local uneasiness and irritation, as to inflict no small amount of discomfort and continuous pain upon the patient. It is principally on this account, and to avoid this difficulty, that, of late years, I have in my own practice commonly brought on premature labor by the other means already alluded to, namely, the detachment of the membranes—a process not requiring the permanent retention of any material in the maternal passages, and capable of being effected with probably less difficulty and trouble to both practitioner and patient.

* See Edinburgh Monthly Journal of Medical Science for Aug., 1844, p. 735; and Feb., 1845, p. 122.

II. SEPARATION OF THE MEMBRANES.

In the induction of premature labor the membranes of the ovum have been proposed to be mechanically separated from the interior of the uterus, by different means, to different degrees, and in different localities.

The idea that the partial artificial separation of the membranes would lead on to labor occurred first to the late Professor Hamilton; and he was himself the first also to put it in practice as far back as 1795.

Dr. Hamilton's method, by the Finger, etc.—In operating, he detached "a portion of the decidua from the cervix uteri,"† by the introduction, first, of his finger, and ultimately of a bent brass wire. His friend, Dr. Burns, describes Dr. Hamilton's operation as consisting of "insinuating a finger within the os uteri, and gently dilating it, and detaching a part of the membranes from the portion of the cervix in its immediate vicinity. If," he continues, "we have not thought it prudent to dilate at once the os uteri, so as to admit the finger freely to touch the membranes, we may repeat the dilatation gently at the end of a few hours, and then detach the membranes cautiously from the cervix uteri by the finger to the extent perhaps of two inches. But for this purpose," Dr. Burns adds, "it may be necessary, if the os uteri be high, to have the *hand* introduced into the vagina; or sometimes the detachment has been accomplished with a catheter or other small instrument."‡ As thus pursued, this mode of inducing labor by separating the membranes from the cervix was not always unaccompanied with pain, particularly when the fingers, and especially the hand, were introduced; it was often very tedious, and sometimes it failed, as Dr. Hamilton himself states, and the operation required to be completed by puncture of the membranes and evacuation of the liquor amnii.

Dr. Kiwisch's method, by injection of water.—In 1846, Professor Kiwisch proposed to bring on premature labor, by injecting a stream of tepid water into the vagina, and against the cervix and os uteri.§ His apparatus, as delineated by Scanzoni,‖ consists of a small, square tin box or reservoir of water, fastened to the wall at the height of nine or ten feet, and from the bottom of this reservoir a tube hangs down, the end of which is, when required, introduced into the vagina, so as to allow a strong continuous stream to pour through it, against the cervical portion of the uterus.

The douching or injection was recommended to be repeated morning and night, and commonly labor supervened on the fourth or fifth day.

This plan of Dr. Kiwisch's was shortly afterwards tried successfully in Vienna, Berlin, etc., by various continental practitioners. In April, 1851, I described a case to the Edinburgh Obstetric Society, in which I used this method.¶ It was an instance where the patient had repeatedly found the child to die a short time after quickening, and retained it for six or eight weeks subsequently. During her last pregnancy, the same occurrence took place with the same symptoms. A few weeks having elapsed, she threw up tepid water at my request, twice a day, with the view of bringing off the dead fœtus. After nine douches, applied night and morning with a common syringe, expulsive pains came on, and a dead and

† Practical Observations on Midwifery, p. 285.

‡ Principles of Midwifery, p. 503.

§ In a chapter on the induction of premature labor, Schweighauser in 1835 speaks of, but does not venture to recommend us—"de provoquer l'accouchment prematuré au moyen d'injections pour decoller les membranes de la matrice."—La Pratique des Accouchemens, p. 274.

‖ Lehrbuch der Geburtshilfe, vol. iii., p. 54.

¶ See Monthly Journal of Medical Science for July, 1851, pp. 88, 492, etc.

shrivelled fœtus and placenta were expelled. In the course of that and the subsequent years I had various opportunities of bringing on premature labor by the same means, and, as I always found, with almost perfect certainty as to the power of its induction.

Professor Kiwisch imagined that the vaginal water injection induced labor by the imbibition of the fluid relaxing the soft parts. The flow of a gentle and small stream of water into the vagina ought, if this were the true principle, to act as well as a stronger current. But a short experience convinced me that this was not the fact; and it soon became evident—1. That the water douche was liable to fail, unless the injected fluid accumulated and distended the vagina, so as to expand that canal and enter the os uteri; and 2. It seemed the more rapid and certain in its action, in proportion as it entered freely into the uterine cavity itself, and in proportion, therefore, as it separated more of the surface of the fœtal membranes from the interior of that cavity.

In only two or three cases did I try an elevated box and syphon tube, like that originally suggested by Kiwisch. From the first, I found a common enema syringe a far better and more manageable apparatus. Usually I have employed the India-rubber syringe of Dr. Kennedy, or that of Mr. Higginson. At first I merely injected and distended the vagina, retaining the fluid in it by closing the vulva with pressure of the fingers or hand, and thus forcing the water to pass upwards through the os into the uterine cavity; but I soon found it a simpler and more direct plan to introduce the end of the syringe through the uterine orifice, and thus send the stream directly into the interior of the uterus, without unnecessarily distending the vaginal canal. In most cases it is easy to pass for this purpose the common ivory nozzle of the enema syringe through the os uteri; but when that opening is placed very high, or far backwards, I have found that the addition of a longish gum-elastic pipe or bent silver catheter to the nozzle of the tube greatly facilitates the requisite introduction of the instrument through the os and upwards for an inch or two, between the membranes and the anterior or posterior wall of the uterus.

While the practitioner is using the syringe and injecting the fluid, the patient should lie on her left side, and with the pelvis placed near the edge of the bed or sofa which she is occupying. A basin properly placed immediately below, both contains the water to be used, and receives it again after it re-escapes from the vulva. The tubes of the catheter and syringe should be carefully filled with the water before commencing the injection, lest a quantity of air be thrown into the uterine cavity. Usually the injection is carried to the extent of the patient complaining of a feeling of distension or fulness; and it may be repeated twice a day, or oftener, according as it is an object or not to expedite as much as possible the supervention of labor.

It was not till I had used this method for a considerable time, and in a number of cases, that I discovered that a similar method had been suggested and described by Dr. Cohen of Hamburg.*

In several cases where the child was placed with the head over the os uteri, I have found it change its position as the water injection proceeded, and an upper or lower extremity to present. Occasionally this preternatural presentation has remained; but more frequently the child has again rotated, and the head again become replaced over the uterine orifice. In no case have I seen any great amount of hemorrhage from partial separation of the placenta. But the repetition of the injection sometimes becomes irksome to the mother as well as to the accoucheur.

Detachment of the membranes, by the uterine Sound, from a portion of the body of the uterus.—Believing that labor was, at the ninth month, induced naturally through the degeneration and loosening of the decidua, I was encouraged last year to try to induce it artificially by the mechanical separation of a portion of the membranes from the interior of the body of the uterus.

In general the stethoscope sufficiently certifies to us the locality of the placenta, and what part or side of the uterus we ought consequently to avoid;† and nothing in the way of an operation could possibly be more simple or more easy and painless than the introduction of a sound, through the dilatable os, and upwards for five or six inches, between the membranes and the anterior wall of the pregnant uterus.

In the first case in which I tried this plan, the patient, after having been always delivered in the country by craniotomy, has thrice had premature labor induced under my care. Her three children are alive. On the first occasion, in 1851, she had an apparatus upon the plan of Kiwisch's erected; but it required to be used, and that frequently, for five or six days before labor supervened. On the second occasion, I injected a quantity of tepid water by an enema syringe into the uterine cavity, and the child was born in about twenty-four hours afterwards. Last year, on the third occasion, I saw her late at night along with my friend Dr. Ziegler, and passed a uterine bougie for five or six inches upwards between the membranes and the anterior wall of the uterus. The child was born before noon next day. At the time of passing the bougie, the patient herself was not aware that anything special had been done, but believed that I was merely making a common digital examination, in order to ascertain the exact stage of pregnancy, etc.; and she subsequently declared that, in her experience, this last method was too simple to be capable of being compared with the two other methods to which she had been formerly subjected. But in all cases, a single introduction of the bougie will by no means suffice. Like the tents and douching, it requires in most instances to be repeated more than once. During the past three months of the present year, I have induced labor six or seven times by this method. In one case, in my own private practice, and in another under the care of Dr. Scott of Musselburgh, the labor was terminated within eighteen hours. In the others, parturition did not come on till the second or third day after the act of separation. In a case which I saw with Dr. Thomson, he used a water injection next day, and on the subsequent day I again separated the membranes with the bougie. Parturient action began that night. In a previous labor of this woman, the child was rotated, and made to present preternaturally by the employment of the water injection. All the children have been born alive in the ten or twelve cases in which I have induced premature labor by the uterine sound.

The relative degree of facility or difficulty with which labor is induced artificially in different women, or even in the same woman in different pregnancies, varies very greatly. Where one plan fails, the addition of a second, or of a third method, will sometimes enable us to succeed; and if all modes less safe for the child prove ineffectual, as the separation of the membranes with a uterine bougie, the water injection, and the sponge-tent, we may always at last determine the certain occurrence of uterine contraction by the puncture of the membranes. And if we have recourse to this puncture, we may still in a great measure save the liquor amnii for the protection of the child during labor by making the seat of the opening oblique and as high as four or five inches above the os, as recommended by Hamilton and Meissner. One of the best instruments for effecting this object is that long ago recommended by Dr. Hamilton, viz., a male catheter having an open or truncated extremity, and provided with a silver wire to pass through it for the puncture of the membranes. The membranes, I believe, will sometimes be found to rupture high up when and where they are simply separated from the body of the uterus by the introduction of the knobbed uterine sound or bougie.

* See Scanzoni's Lehrbuch, vol. iii., p. 53.

† In injecting water we have no control on the *direction* it will take in the uterine cavity, while we can regulate perfectly that of the Sound. In one case, from inattention to the uterine souffle, I probably separated the edge of the placenta, as a clot was found at that spot. The child was born alive; and the mother recovered perfectly. But with due caution such an accident should be easily avoided.

CHAPTER XXVIII.

GENERAL OBSERVATIONS ON UTERINE PATHOLOGY; EFFECTS OF LABOR AND LACTATION; INVOLUTION IN DEFECT AND EXCESS.—*BARNES.*

In studying the pathology of the uterus, it is especially necessary to keep in constant view the peculiarities of structure and the physiology of the organ. No organ in the body undergoes such remarkable physiological changes. At each menstrual period there is increased vascularity, increased volume, increased muscular energy, the development of new tissue, followed by a retrograde process of involution, which effects the return to the ordinary state. At every pregnancy the changes wrought are more wonderful still. Under its physiological influences, the uterus is thus continually subject to alternate hypertrophy and atrophy, or more strictly speaking, involution. The mucous membrane is endowed with extraordinary regenerative power. And these active reproductive and solvent forces inherent in the uterus are constantly ready to be called into action on any abnormal stimulus. Thus, if a fibroid tumor form in the uterine wall, or project into its cavity, the vessels and tissues respond just as they do to the stimulus of impregnation.

Interruptions, then, to the fulfilment of the organic changes evoked by function will account for a large proportion of the cases of uterine disease, especially congestion, engorgement, hyperplasia, hypertrophy, atrophy. Continually recurring functional acts will also exert an influence, generally injurious, sometimes beneficial, upon morbid conditions.

Perhaps there is no organ in the body so prone to hypertrophy as the uterus. Its functional hypertrophy has often been likened to inflammation, notably that hypertrophy of the mucous membrane which results in the formation of the decidua.

The diatheses also must not be overlooked. When one of these exists, it may be the primary cause of the development of disease in the uterus; or, if one of them happen to complicate uterine disease which has arisen from other causes, it will impress its stamp, will greatly increase the difficulty of cure, and will, therefore, dictate largely the course of treatment. The strumous, dartrous or herpetic, rheumatic or gouty diatheses, or the syphilitic, tuberculous, or cancerous cachexiæ often play a most important part in the production, continuance, and curability of uterine diseases.

The uterus is liable to alteration of structure and disturbance of function from causes external to itself. Some of these may take their rise in distant organs, some in neighboring organs; and the uterus, as an integral part of the whole organism, is subject to the constitutional disorders which affect the body, and to the disorders ensuing upon the multitudinous varieties of toxæmia. Thus the uterus is liable to tubercle. The blood dyscrasiæ which dispose to hemorrhages from the mucous membranes are perhaps more likely to induce hemorrhage from the uterus than from other organs. This is especially true during the period of sexual activity. Thus scurvy, small-pox, measles, often cause uterine and tubal hemorrhages.

Certain medicinal substances or poisons circulating in the blood act with special intensity upon the uterus.

The uterus is remarkably susceptible to nervous impressions, emotional, reflex, and so-called sympathetic; and through these nervous impressions it is certain that functional and even structural disturbances are produced. The uterus stands in the most intimate correlation with the ovaries and breasts. With the ovaries it is directly associated by its vascular supply, which may be said to be common to both organs. The vessels supplying both so freely anastomose that it is impossible for hyperæmia to exist in the one without involving the other in a similar condition. This is most strikingly manifested in the uterine hyperæmia evoked by the ovarian menstrual nisus; but it is almost equally clear that what is called ovarian dysmenorrhœa reacts upon the uterus also.

The application of the suckling infant to the breast often causes contraction of the uterus. I have often known it cause uterine hemorrhage. Many women are conscious of pain in the uterus when suckling. The application of leeches or blisters to the breast has brought on menstruation.

Obstinate *pruritus pudendorum*, by keeping up a constant excess of blood and local nervous disorder, not seldom brings about a congestion, enlargement, or infarction of the uterus.

The uterus in its turn is the starting-point for manifold affections of the distant organs, and of the general system. I do not in this work more than glance at the influences which the pregnant womb exerts. Those which spring from the non-pregnant womb are scarcely less striking.

The uterus is especially liable to change of structure and disturbance of function under the influence of changes affecting its neighboring organs. Floating, as it does freely, between the bladder and the rectum, it is subject to constant change of position, according to the varying conditions of fulness or emptiness of these organs. Of course, so long as these conditions are within physiological limits, the uterus adapts itself readily to them; but if the natural mobility of the uterus be impeded, as by plastic deposits about the broad ligaments, by blood-masses and plastic deposits in the retro-uterine pouch, by tubal gestation, or by any body becoming attached to it, uterine hyperæmia proceeding to infarctus or hypertrophy is sure to follow. In every case of pelvic peritonitis, or so-called pelvic cellulitis, the uterine walls are found thickened. This is a frequent cause of secondary puerperal hemorrhage, and of hemorrhage continuing for months after labor as menorrhagia. This, it may be said, is due to arrested involution from the state of pregnancy, this form of inflammation commonly arising after labor or abortion. But I believe this is only one particular instance of a general law. The same state of engorgement and hyperplasia is observed, no matter what the cause which fixes the uterus. This fixing and the attendant changes in the circulation of the organ account in great part for the enlargement of the body of the uterus, which takes place when cancer invades the neck. If inflammation begin in the broad ligament, or in Douglas's pouch, not spreading to the uterus, but fixing it by external deposits, enlargement equally follows.

The uterus also, I have observed, is liable to hyperplastic enlargement, as the result of oft-repeated or long-continuous hyperæmia produced by disorder of the liver, kidneys, or heart.

We shall find the history of the natural changes ensuing upon menstruation, pregnancy, and labor to be a necessary introduction

to the right appreciation of engorgement, inflammation, hypertrophy, prolapsus, versions and flexions of the uterus, and of other uterine and peri-uterine affections. This history, then, which really includes the study of the etiological relations of so many disorders, will here be briefly traced.

EFFECTS, LOCAL AND CONSTITUTIONAL, OF LABOR AND LACTATION.

A very large proportion of the cases of uterine disease which come under treatment are the result, more or less immediate, of parturition. To understand this aright it is necessary to study what are the effects of parturition upon the uterus. Parturition is a violent process. Even in ordinary labor the dilatation of the cervix uteri is effected in great part by the direct pressure of the head or other part of the child. In many cases the pressure thus exerted amounts to severe bruising, contusion of tissue, attended by a partial sliding, a glacier-like movement of the mucous membrane, away from the subjacent tissues. This traumatic process necessarily involves the rupture of many small vessels, producing ecchymosis and serous effusion in the connective tissue, and even in the wall of the cervix. That the edge of the os externum uteri is almost constantly torn in first labors is notorious.

Impeded Involution.—The first in time, if not in importance, of the results of labor, is the persisting enlargement of the uterus, which marks the failure of the process of involution. Within a month the uterus ought to complete its return to the ordinary state; that is, it ought to recover from a bulk represented by one and a half pounds weight or more to two or three ounces. This wonderful change is brought about chiefly by two processes. The first is one of active and tonic contraction of the muscular fibre, which, by diminishing the bulk of the organ, squeezes out of its vessels all superfluous blood. The second process is a compound one of absorption and excretion. The now useless solid tissue is first converted into granular fat, then absorbed into the circulation, and lastly ejected from the organism by the glandular apparatus. Both these processes are liable to be impeded. The first and most essential act, that of vigorous and persistent muscular contraction, is often badly performed. A degree of hæmostasis remains, which keeps up congestion, disposing to hemorrhage and inflammation. The excessive bulk and weight of the organ occasion local distress. This condition, moreover, retards the second essential process of absorption. And if to this be added, as is too commonly the case, feeble glandular action and weak nutrition, involution is seriously retarded.

Besides mere want of power, other causes may concur in frustrating the due involution of the uterus and vagina; and these it is desirable to enumerate. Associated under the general term, want of power, we of course include the influence of accidentally complicating diseases, as fevers, phthisis, and of the cachexiæ, as struma and syphilis. Under the influence of these diseases involution rarely goes on well. A marked excess of bulk, with chronic endometritis, may be observed for weeks and months. Flooding during and after labor, by weakening general power, and especially by impairing tonicity of muscular fibre, retards involution. The occurrence of perimetritic inflammation during child-bed, especially if attended by effusions which impede the mobility of the uterus, surely retards involution. Indeed, I think it may be laid down as an aphorism that whenever the mobility of the uterus is arrested, whether the cause be external or internal, a degree of hyperplasia is the result. Thus, as in the case just mentioned of perimetritic adhesions, imperfect involution and a process of slow infarction follow. In the case of extra-uterine gestation, where the fœtal sac comes into adhesion with the uterus, the primary development of the uterus under the stimulus of conception is maintained, and even exaggerated. When peritonitis and adhesions form from malignant disease, the uterus is always increased in bulk, and this increase is greatly due to this cause, not alone to the direct influence of the malignant disease.

The inevitable injury inflicted upon the cervix, and especially upon the vaginal-portion, may evoke such an active process for repair that general involution may be impeded.

Displacements of the uterus also impede involution; and displacements are very apt to occur after labor. The most common displacements are retroversion, retroflexion, and prolapsus. When one of these occurs the free circulation through the uterine vessels is necessarily interrupted. The arteries may pump in blood, but the return by the veins is obstructed by the tortuous course and angulations produced by the displacement. Hæmostasis, frequent metrorrhagia, arrest of involution, and continuous infarction are the result.

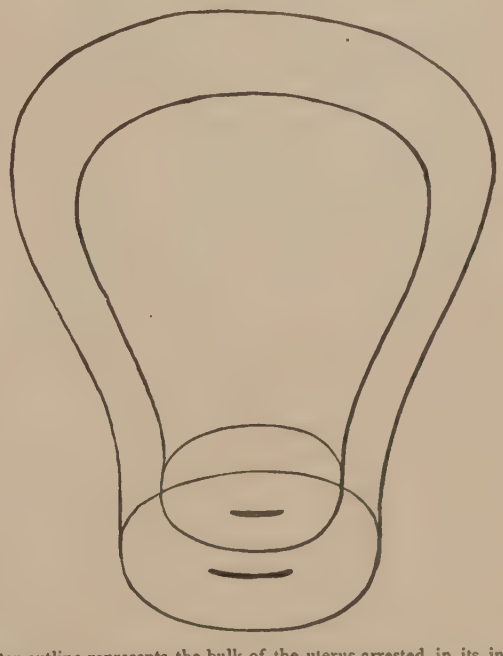
Fibroid tumors, or polypi in the uterus, retard involution, by keeping up a developmental attraction of blood. It is a kind of spurious gestation.

I am disposed to fix the normal period required for complete involution as one month. But this applies to persons in health, and placed in favorable circumstances. Hospital air is an unfavorable condition; and I am told that in the lying-in hospitals abroad six weeks is the time usually required.

The reduction in size which the uterus has to undergo, and the brief space within which this change has to be effected, constitute one of the most striking facts in physiology. At the full term of pregnancy the cavity of the uterus, says Simpson, contains above 400 cubic inches; and in the non-pregnant it can hardly be said to be equal to one cubic inch. Yet to this latter capacity the uterus must be reduced in a month.

The extent of involution of the uterus after labor may be accurately traced, by observation, by touch, and by measurement with the sound. The following diagram (Fig. 130), from Simpson,

Fig. 130.



The outer outline represents the bulk of the uterus arrested in its involution after pregnancy. The inner one represents the bulk it ought to attain. (After Simpson.)

gives an idea of the ordinary difference in bulk of the uterus in which involution has been arrested, and that of the uterus in its ordinary state.

Dr. Snow Beck showed to the London Medical Society (1851) a specimen of arrested involution, under the title "A New Disease of the Uterus." The structure of the hypertrophied uterus showed no inflammatory or heterologous deposits; but the tissue of the organ was similar in its histological characters to the tissue of the uterus at the ninth month of pregnancy, except only that its component fibres were smaller in size.

The evidence of the traumatic injury sustained in labor remains

in the indented cicatrices round the margin of the os, which are characteristic of the vaginal-portion in women who have borne children. But if the parts be examined soon after labor, much more striking marks of the injury they have sustained will be witnessed. Immediately after labor the vaginal-portion is large, flabby, pulpy, so as to be almost indistinguishable to the touch. It is some days before it retracts to any considerable extent, or regains much firmness of texture. The tissues of the cervix and of the connective tissue surrounding the vessels at their entry from the broad ligaments is infiltrated with serum, which has to be absorbed. The entire thickness of the vaginal-portion, as I have repeatedly seen in post-mortem examinations, at the end of a week or even ten days after labor, is still soft, large, and black from ecchymosis.

It must also be remembered that the vagina during pregnancy and labor undergoes changes analogous to those which affect the uterus. During pregnancy the extreme vascularity of the vagina gives a characteristic test of this condition. Its walls grow in length and breadth; its tissues become softer and more distensible. To the touch this is very perceptible. During labor it is subjected to enormous distension, and even violence. Involution will be arrested under the same conditions as those which arrest involution of the uterus. The vagina then remains larger and looser; folds may even project through the vulva. Thus we get a heavier uterus, which has to be supported by a vagina of less than usual power.

Under favorable circumstances, the process of repair is rapid and complete. But in a great number of instances, the conditions are not favorable. Repair is retarded by a weakly state of the constitution, by the intercurrence of various morbid actions, by imprudence in getting about too soon, and the too early resumption of ordinary duties. I am persuaded that *rest, physical and physiological*, for at least a month after labor, is essential to complete the repair of the injuries sustained, and the involution of the pelvic organs. This proposition will, perhaps, appear overstrained in the opinion of those who advocate a generous diet from the day of labor, and removal to the drawing-room in less than a week. I have so frequently seen pernicious effects, immediate and remote from this practice, that I cannot hesitate to condemn it. It is easy to adduce any number of cases of women who have been thus treated, and have made good recoveries. But the practice is not thus justified, if the exceptions also are numerous. It is true, that many women return to their ordinary mode of life within a fortnight, and continue with more or less success to perform their duties. But the frequent penalty is uterine and constitutional disease. The speed and completeness of recovery from labor depend also greatly upon the health and physical power of the individual. Women accustomed to hard work, hard living, and exposure to the weather, complete the process of repair much more quickly than those who are nursed in luxury, and whose first experience of hard work is acquired in the task of bringing forth a child. In the first class of women, the muscular, vascular, and glandular systems are in vigorous working order. Effete matter is quickly got rid of. Every organ soon returns to its wonted state. In delicate and pampered women, on the contrary, the muscular fibre is lax, the glandular organs, especially those of the skin, are imperfectly developed, they do their duty feebly, and are easily overpowered when an unusual strain is thrown upon them. The nervous system is stimulated beyond measure, and acquires predominance over the rest. Under these conditions it is not surprising that the extraordinary revolution in the system, and the important local changes which have to be effected after labor, are accomplished with difficulty, imperfectly, and are the point of departure for various constitutional and local morbid processes.

Neglect of the due period of "rest" for repair is especially apt to retard the restoration of that part of the uterus to which the placenta adhered. The changes that have to be effected here are more extensive than in the rest of the internal surface. It is no uncommon thing to see, in women dying a month and more after labor, a rough area, marking the site of the placenta. This is often covered with a muco-purulent secretion, showing that the return to the ordinary condition is not completed. It is easy to understand that to tax the uterus in this condition with the premature resumption of functional work, will start endometritis, which will readily assume a chronic and even permanent character.

Analogous conditions follow abortion, although the actual violence inflicted upon the cervix is not so important an element. Abortion also differs from labor at term in this respect: the development of the uterus is brought to a sudden termination prematurely; that is, before the tissues and the system have attained the conditions favorable to rapid and complete involution. Within the first three or four months, for example, the muscular contractibility of the uterus—a prime agent in starting healthy involution—is not nearly so effective as at term; and, in addition to this, the transformation of the mucous membrane into decidua is arrested at a stage when the adhesion to the uterus is much more intimate, more vascular, and embraces a relatively much larger area. Its separation is a far more violent process; and if, as is not unlikely, the mucous membrane was unhealthy before conception, its separation will be apt to leave a subacute endometritis, with unhealthy new mucous membrane.

Rest is as essential after abortion as after labor. The indifference with which many women in every rank regard "a slight miscarriage" is a source of much future trouble. A miscarriage is looked upon as slight in proportion to the earliness in pregnancy at which it occurs. But it is a grave error to measure in this way the importance of an abortion. The earliest abortion may entail consequences far from slight, if due hygienic precautions are not observed.

Now, one of the surest means of inducing some one or more of the foregoing involution-retarding conditions is premature exchange of "rest" for exertion. The upright posture within the first week or fortnight will surely increase the local vascular tension, and promote displacement of the uterus. To add the influence of gravity, and of increased hydraulic pressure in the vessels whilst the uterus is still of inordinate weight, and its supports are disabled, cannot fail to be injurious. The most healthy stimulus to uterine involution is the natural function of lactation. If this duty—this physiological complement to parturition—be neglected, involution will not go on smoothly. The application of the infant to the breast causes contraction of the organ. It is injurious to lose this. Lactation, moreover, causing a derivation of physiological activity to a distant organ, tends to promote rest in the pelvis. Indeed, one of the beneficent purposes of this alternative or cyclical action of the generative organs, is to give each in its turn the rest that is necessary for restoration. This natural order cannot be broken with impunity. The penalty, or rather one of the penalties, of suppressing the function of the breasts, by depriving the uterus and ovaries of their allotted respite, is the resumption of work before they have had time or opportunity to recover their fitness for the task.

It is to this evil that women of the easier classes are more especially exposed. The increasing neglect of the function of lactation is, I believe, a prolific cause of uterine disease. This neglect does not, however, entirely arise from indifference to maternal duties, or the fancied more imperative duties of social life. The inability to suckle is, in numerous cases, real. The system, the breasts, want the power, the capacity, to secrete milk. After honest endeavors, it is too often found that after a few weeks of scanty secretion and painful suckling the child and mother alike show evidence of the futility of the effort. Nothing can lend stronger confirmation to the theory I have expressed, as to the relative unfitness of women nursed in luxury to carry out in its completeness the function of reproduction, than this failure of the breasts. The breasts are glandular organs developed out of the skin. They are closely analogous in structure to the sebaceous glands of the skin. Their activity and degree of development may be taken as a measure of the activity of the skin and other glandular organs. All show the

same kind and degree of incapacity. Unless the general system have been duly exercised and called into activity by the whole course of life, the glandular system, like the rest, will remain imperfectly developed. It is unreasonable to expect the breasts to become all at once competent to their work.

On the other hand, there frequently occur amongst the working classes and others, cases where involution of the uterus is arrested by lactation. This is because lactation is a task that exceeds the strength. Deficient food, bad health, and hard work combine to exhaust the struggling mother. The process of repair is arrested, and a chronic endometritis, with engorgement, abrasion of epithelium from the os uteri, and leucorrhœa, sometimes tinged with blood, or even alternating the metrorrhagia, always more or less prolapsus or retroversion, result. The worn, thin, pallid aspect of the subject attests exhaustion. The pulse is small, accelerated; nutrition is feeble; the muscles are flabby; at one point muscular debility is invariably marked—the dorsal muscles, especially between the scapulæ, are always painfully aching; they are in fact overstrained by the heavy burden of carrying the child. The nervous system in many ways suffers from imperfect nutrition; vertigo, syncope, are the sure signs of anæmia, and show how the brain is starved; dimness of sight, muscæ volitantes, every degree of amaurosis commonly attended.

Mr. Jonathan Hutchinson has investigated this subject with a sagacity pointed by an unsurpassed range of pathological knowledge. He rightly says that dimness of vision during suckling may be merely an indication of the existence of hypermetropia, and does not necessarily indicate retinal disease. Until weakened by lactation, many hypermetropic women experience no inconvenience, being able to bear the accommodative strain necessary to overcome the error of refraction; but during lactation they find it difficult to keep the ciliary muscle up to its unusual exertion. He says it is well to examine if spectacles are not requisite.

Any nervous affection to which the subject retains a predisposition, from antecedent attacks or from hereditary transmission, is now extremely apt to break out. Thus, overlactation induces a recurrence of epilepsy, chorea, hysteria, ague: affections from which the subject might otherwise have been freed.

Another point of suffering is the lower lumbar and sacral region. This is partly the indication of reflex distress, proceeding from the diseased uterus, partly of pressure of the enlarged organ on the pelvic nerves, and partly of spinal exhaustion from the constant wear and tear occasioned by the irritation of a diseased organ acting upon an imperfectly nourished nervous centre.

These subjects will also frequently complain of pain referred to the seat of one or other ovary, most frequently the left. This Dr. Henry Bennet has long insisted upon as characteristic of irritation propagated from the inflamed cervix. It may, according to him, and I am disposed to agree with him, be regarded as a consensual pain. Others, however, regard it as an indication of actual ovarian inflammation.

The period when overlactation may be said to have begun cannot be fixed. It is determined by the relative strength of the individual. Whilst it may be said that few women are able greatly to transgress the normal period of nine or ten months with impunity, it is certain that many show all the signs of overlactation much earlier than this. We must, then, look to the symptoms, and not to the time the patient has been suckling.

In a considerable proportion of cases, the functions of the ovary cannot be suppressed beyond a few months, if at all. It is in vain that the attempt is made to keep ovulation, with its consequences—menstruation and pregnancy—in abeyance by taxing the breast. The ovary is the dominant organ, and sooner or later will assert its supremacy. Accordingly, we often find one of two things taking place in the course of lactation. First, menstruation returns, sometimes in a few months after labor, and generally within a year, except, indeed, phthisis or other exhausting disease intervene, or premature atrophy of the ovaries and uterus be induced; or, secondly, a new pregnancy occurs. This may, or may not, be preceded by a menstrual appearance. Some women "never see anything from one pregnancy to another." Whilst suckling, they fall pregnant, without exactly knowing when. The position of a woman in this predicament is indeed trying. She is laboring to support three beings at the same time. She is goading into simultaneous work the breasts and uterus, which ought to relieve each other. No wonder if, under this double outrage to nature, her own strength break down, and if the welfare of the child at the breast, and the existence of the embryo in the womb, be equally imperilled. Accordingly, we often observe that abortion occurs under these circumstances. This accident is the combined result of the degradation of the mother's blood, which becomes unfitted to carry on the nutrition of the embryo and of the structures which bring it into relation with the mother; of the reflex irritation constantly starting from the breast, and promoting congestions and contractions in the womb; and of displacement, such as prolapsus or retroversion and chronic metritis.

The condition of the uterus after the exhaustion of overlactation is usually characteristic. It bulk is somewhat excessive; its canal is patulous, easily admitting the sound; the cavity of the body is a little dilated, so that its walls are not in apposition, as in the healthy uterus; the appearance of the vaginal-portion is peculiar: its aspect is pallid, partaking of the general anæmia, its lips are swollen out in lobes separated by the scars resulting from the slight rents which were produced during labor; to the feel and sight the tumid os is flabby, soft, as if œdematous; all around the os, and some way inside the cervical cavity, the epithelium is often abraded; tenacious viscous mucus fills the canal; the sound always causes a little oozing of blood; and metrorrhagia is usual. Such is a common condition. Sometimes there is great congestion and appearance of vascularity. The abraded portions present little granulating elevations, secreting a semi-opaque mucus. The margin of the abrasion is well defined; where the structure retains its epithelium investment the color is bluish or purple. This color becomes much deeper if pregnancy has supervened.

Although ready to sink from physical exhaustion, the mother still clings to the burden which is dragging her to the ground. It often requires the most decisive authority the physician can exert to induce these poor women to give up the unequal struggle. The most effective argument often is to point to the child, which is generally pale, thin, deficient in the firmness of healthy nutrition. We may thus more easily persuade the mother to give up a course which, whilst surely sapping her own health, is doing her child no good.

To wean, then, is generally the first injunction. The other indications are to restore the general health, to improve nutrition, to bring back the proper proportion of red globules to the blood, and at the same time to cure the local disease.

In these cases quinine and iron are of inestimable value; strychnine is of scarcely less. They almost take rank as food. The doses should not be large, especially at first. One, or at most two grains of quinine, two or three times a day, and one-thirtieth of a grain of strychnine is enough. More will not be tolerated if the exhaustion is great. Quinine has a special beneficial action beyond that as a general tonic. It has a distinct property in causing contraction of the uterine fibre. In this way it promotes involution, the diminution of congestion, and the tendency to metrorrhagia. To produce this action, larger doses are useful. Strychnine possesses a simular property in a marked degree. That the diet should be as generous as can be digested, it is needless to say. Alcohol should form a moderate, strictly limited ingredient. The light wines of France, the Rhine and Hungary, are the best stimulants and aids to digestion. But where it can be digested, good stout or ale, to the extent of a pint or two pints daily, is to be preferred. Codliver oil is often of great use. Under this regimen, the blood is speedily enriched in quality, and the effect is seen in returning strength, in improved nutrition, and more vigorous performance of all the functions. We shall thus have gained one necessary condition for the repair of local mischief. Without this improved constitutional power, mere local treatment would probably fail.

The local treatment required is generally simple. One condition is rest. This is partly attained by keeping the prolapsed uterus at its proper level by means of a Hodge's pessary. This brings singular aid also by relieving the local hyperæmia, by facilitating the return of blood from the uterus. Once every four or five days the abraded surface of the vaginal-portion and the interior surface of the cervix uteri should be lightly touched with solid nitrate of silver. Or a stick of three grains of sulphate of zinc may be introduced every third or fourth day into the cervix. A vaginal injection of oak bark, tannin, or sulphate of zinc, or alum, should be used daily, or even twice a day. The cold douche, if it can be borne without pain, is often useful. In summer the cold hip-bath may be employed.

Under this treatment the abraded surface will commonly heal over, the congestion disappearing, the bulk of the cervix becomes reduced, the tendency to prolapsus is lessened by this diminished weight of the organ, and by the recovered tonicity of the vagina and other uterine supports. If at this time, when all active inflammation has ceased, any marked degree of enlargement of the vaginal-portion and bearing down remain, we find a useful remedy in the *potassa cum calce* or Vienna paste. This should be rubbed gently across the most enlarged lip of the os uteri, so as to produce a small eschar. This sets up a moderate degree of local irritation which stimulates to healthy granulation, and excites absorption. The raw surface will cicatrize within a week or ten days, and the bulk of the vaginal-portion will commonly be reduced.

This treatment, although limited to the vaginal-portion and the canal of the cervix, exerts a beneficial action upon the enlarged body of the uterus. It is certain that the congested, inflamed state of the vaginal-portion keeps up a similar condition of the whole organ; and it is also a matter of experience that remedies applied to the vaginal-portion act not only by removing the irritation of contiguous disease, but also by derivation. The eschar, for example, set up by *potassa cum calce* upon the os uteri, acts by derivation upon the body as a blister does upon internal organs.

To set involution going, when the case is acute, Simpson recommends local antiphlogistics. This treatment is especially indicated where any trace of inflammation remains. But in cases where all inflammatory action seems to have died out, he says, a local antiphlogistic course has the effect of setting up absorption in the enlarged organ. If the patient is not very weak, he advises the application of a dozen leeches to the vaginal-portion of the uterus or to the perineum.

In these more acute cases, and in all the more chronic cases, he insisted on the use of counter-irritants. Antimonial or croton ointments, or the cantharides blister applied to the hypogastric region, or painting this region with tincture of iodine until it produced vesication, were amongst his remedies. At the same time he kept the vaginal-portion of the cervix uteri immersed in ointments of mercury or iodide of lead, or bromide of potassium introduced as vaginal pessaries.

As internal remedies he relied upon iodide and bromide of potassium.

Scanzoni recommends the introduction into the vagina every night of a sponge saturated with a solution of iodide of potassium in glycerin, in the proportion of one in eight, or of an ointment consisting of five grains of iodo-chloride of mercury in an ounce of lard.

I have found the iodine and glycerin decidedly useful.

Dr. Gustavus Murray recommends the use of the galvanic pessary.

I have also seen reason to think favorably of the use of the bromo-iodic waters of the Woodhall Spa.

One is frequently asked "How long will it take to get well?" To this the physician can give no definite answer, unless all the conditions of cure be placed fairly within his control. Whilst the patient is pursuing more or less actively her usual course of life, and the treatment is often interrupted, the disease may linger for any length of time. But take her into hospital, where all the necessary measures, negative and positive, hygienic and medical, are systematically carried out, and a cure within two or three months may with confidence be predicted.

Closely associated with this subject is that of *inflammatory engorgement and abscess of the breast.* This condition is commonly the result of, and bears evidence to, constitutional debility, and unfitness of the breast for its function. It occurs at two distinct periods. The most common is at the onset of the attempt to suckle. The other period is after lactation has been kept up for some months. Strumous women, who are specially liable to glandular and connective-tissue engorgements, are particularly liable to early abscess of the breast. The constitution and the organ at once rebel. If the attempt to force them be persisted in, phlegmons and abscesses are sure to form. It is not within the scope of this work to discuss the physiology and pathology of pregnancy and childbed. I refer to lactation only in reference to our present subject. Much as, both in the interest of mother and child, it is desirable to suckle, it is better, where the function is not likely to be successfully carried on, not to make the attempt. It is rare for abscess to form where no attempt to suckle has been made. The constitutional conditions which contraindicate lactation are general debility, anæmia, a strumous diathesis; the local conditions are, depressed, undeveloped, excoriated nipples, or evidence of phlegmons in the breasts. These conditions, and others, lead to retention of milk. The secreted milk clogs the milk ducts, and this condition leads to stasis, and inflammation in the capillary network surrounding the acini. When it has been determined to abandon lactation, it is a common practice to apply belladonna to the breasts under the belief that this drug possesses the property of drying up the milk. I very much doubt its efficacy. I have more faith in the internal use of iodide of potassium. To check secretion, Dr. Altstädter extols conium, given in one or two-grain doses four or five times a day. The distinct indication is to avoid stimulating or exciting the breasts. If it be desired not to promote the secretion of milk, the breasts should be kept in perfect rest. It is in carrying out this indication that the physician will experience the greatest difficulty. It is a conviction rooted in the minds of nurses with all the tenacity of prejudice, that friction, and that not always gentle, and "drawing the breasts," are necessary. This infallibly keeps up irritation. Engorgement and inflammation are too apt to follow. One condition of rest is repose in bed, another is gently supporting the breasts, so as to obviate any tendency to hanging down; they should be kept well lifted up from below and from the sides; the easy return of the blood from them thus diminishes the risk of stagnation; another way to promote rest is to use the arms as little as possible. If there be any engorgement, it is well to keep the arm of the affected side in a sling. Cooling lotions, as of acetate of ammonia and alcohol, are useful. It is only when there is great tension, that the overflow should be gently abstracted by a breast-pump, or, better still, by the soda-water bottle heated by hot water and then applied empty, so as to draw by vacuum. This is far safer in the hands of an ordinary nurse than the breast-pump. Saline purgatives, and moderate unstimulating diet, especially postponing the conventional stout, are essential adjuncts.

When mammary abscess occurs after lactation has been carried on for several months, this is almost certainly because the system has been so reduced that it is no longer fit to keep up the function.

Simpson described (Med. Times and Gaz., 1861) *superinvolution of the uterus* as a morbid state, the opposite of *subinvolution.* It is produced when the disintegrating process set up after delivery goes on to such an excessive degree as to reduce the uterus to a size decidedly below its normal dimensions in the unimpregnated state. He relates a case of a woman aged 20, who never menstruated after her first labor. Two years after labor she was admitted to the Edinburgh Infirmary. There was amenorrhœa, great constitutional disturbance, frequent attacks of diarrhœa, which she believed to be most severe at recurring monthly intervals, the dejections being sometimes tinged with blood. The mammæ were shrunk and flat. The uterus was small; its cervix much atrophied, os contracted. Sound penetrated 1.5". Albuminuria and dropsy preceded death. The uterus was one-third below the natural bulk; the ovaries were atrophied, showing no Graafian vesicles.

Sometimes atresia from cicatricial closure of the uterus is followed by a true amenorrhœa—not simply retention. Dr. Lizé reports such a case in the "Union Médicale," 1863. The uterus seems to become atrophied from obstruction to the performance of its functions.

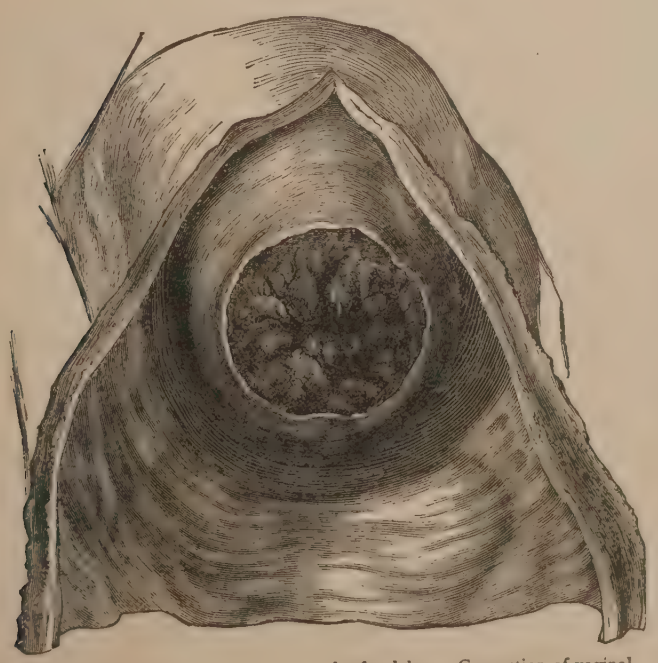
RESULTS OF INJURY TO CERVIX UTERI DURING LABOR.

If we pursue the clinical, and, in this instance, the historical order, in the study of the most common morbid conditions of the uterus, we shall find succeeding the first stage of tumefaction, ecchymosis, and congestion of the mucous and submucous tissues of the cervix, and the shedding of the bruised epithelium, the following condition: The whole cervix, especially the vaginal-portion, is sensibly enlarged, tumid, gorged with blood, œdematous; for a definite area around the os, the part is bared of epithelium, giving a pulpy granulating appearance to the part; this part is further divided into lobes or prominences, the result of the small lacerations which took place during the passage of the child; this bared part is red, angry-looking from the villi being full of blood, bathed with viscid and purulent-looking secretion; the part of the vaginal-portion, beyond the line of epithelial denudation, looks bluish-red, owing to the gorged blood-vessels being seen through the epithelial investment. The vaginal-portion in this state easily bleeds under examination, under coitus, and under any exertion or emotion. Leucorrhœa is generally copious. Lumbar pain is constant. General prostration certainly attends. Some degree of prolapsus is rarely absent.

A similar state exists throughout the cervical canal. The rugæ are prominent, bared at least in part. The surface is bathed in viscid, clear, or turbid mucus. The canal is more patulous than usual. Intensely vascular, and the vessels badly protected by delicate new epithelium, which is being shed as fast as formed, the intra-cervical surface easily bleeds, so that metrorrhagia is common. All this can be easily seen through the metroscope, or even in part through the bivalved speculum, whose blades, made to diverge, open the os externum.

Some of these objective conditions are fairly illustrated in Fig. 131, drawn from nature from a case observed about a month after

Fig. 131.



Shows condition often observed a month after labor. Congestion of vaginal-portion. Epithelial denudation around the os. (From nature. R. B.)

labor. This drawing shows also the enlarged relaxed state of the fundus of the vagina which attends this stage of the affection.

By some this condition is called "inflammation;" and the state of the os uteri, bared of epithelium, is called "ulceration." In some cases, undoubtedly, inflammation intervenes; and the question of ulceration is one of doctrine. What is ulceration? If we consult the most recent authorities for an explanation, we find Simon (Holmes's "System of Surgery") defining ulceration as a destructive process of inflammation: "It is the process by which holes are made through the surface-textures of the body (cutaneous, mucous, articular, or serous), and hence perhaps into deeper parts; a process which differs from gangrene mainly in the fact that it proceeds more gradually and molecularly. At the place where an ulcer exists, the absent texture perished as truly as by gangrene; but while gangrene would have occasioned its abrupt separation in mass, ulceration permitted its progressively shedding as detritus. The discharge from any spreading ulcer, if examined under the microscope, invariably exhibits particles of disintegrating tissue; and the so-called foulness is but gangrene on a smaller scale."

Macleod (Cooper's "Surg. Dict.," 1872) gives a similar explanation. He says, "Ulceration is a result of inflammation, and consists in the molecular death and removal by minute disintegration and solution of the superficial vascular particles of the inflamed part. There is a minute atomic division of the particles of the affected tissue, and these molecules are removed in the 'ichor' or discharge which escapes from the surface of the sore or 'ulcer' which forms. The terms desquamation, or excoriation, or abrasion, are applied to the removal of epithelium alone, while ulceration implies a deeper penetration of the destructive action."

If we next examine what is meant by inflammation, we find Simon giving the following account of what takes place in this process:

"The capillaries allow fluid to sweat through their coats from the liquor sanguinis to the tissues. In this way they minister to growth. If the membrane be ruptured or dissolved, normal transudation is at an end, and capillary hemorrhage takes place.

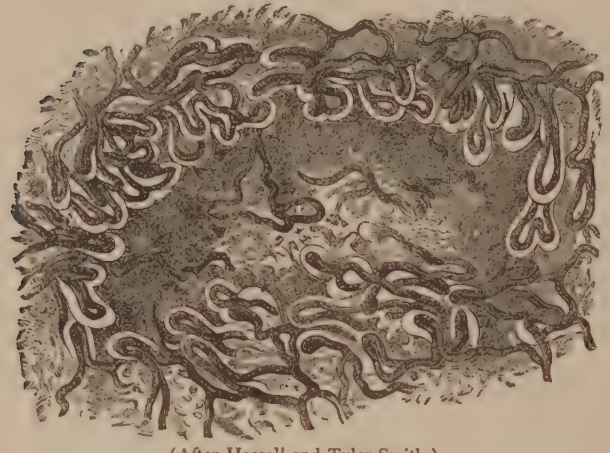
"The arteries are more relaxed, carry a profusion of blood. The veins carry more blood than usual; but not all that the arteries carry into the tissues: something is left behind in the tissues."

Now, in the typical case before described, is there not greater relaxation of the arteries? do they not visibly carry more blood? do not the veins carry more blood? and is there not something left behind in the tissues? It is impossible not to answer all these questions in the affirmative. And so of ulceration: is there not gradual shedding of tissue as detritus? does not the discharge exhibit particles of disintegrating tissue? is there not a hole through the mucous surface-texture? Or is this breach of surface the result of gangrene? According to the historical and clinical points of view from which I have regarded the condition, it appears to be a combination of the two processes of gangrene and ulceration. The first step is traumatic; the mucous membrane is really killed by the bruising it underwent, and the partial severance from the deeper textures upon which it grew. Hence it is cast off by a process which cannot be distinguished from gangrene. It is remarkable that the area of epithelial denudation is almost always strictly limited.

There is a more or less indented irregular line of demarcation where the epithelium stops abruptly at a distance of about half an inch from the centre of the os uteri. This line represents accurately the extent of the mucous surface which fell under the crushing of the passage of the head. The fissures seldom or never go beyond this line. Nor does the area of denudation tend to spread beyond it. In this respect the case differs from that of surface-ulceration. If there be ulceration it must be by destruction of tissue within this circumscribed area; that is, in depth. Of such action, however, there is usually very little. Probably the eroded appearance of the bared villi, accurately, as I know it is, represented in Hassall's drawing (Fig. 132), is also due, like the casting of the mucous surface, to traumatism and necrosis. I do not think that the destructive process is commonly progressive in depth any more than it is in superficies. The process is essentially and truly one of repair; often, indeed, arrested by the excess of congestion of

the part and by the general blood-degradation of the system. But still it is a rare event for this process of arrested repair to pass into the opposite condition of extending destruction. The hypothesis of ulceration has been favored by the aspect of the denuded part, which strikingly simulates that of a granulating ulcer on the skin. But the observations and figures of Dr. Hassall, in Tyler Smith's "Memoir on Leucorrhœa," conclusively show that the apparent granulations are really the projecting villi jutting out irregularly on the surface, having lost the protecting epithelium which bound down smoothly all surface inequality.

Fig. 132.



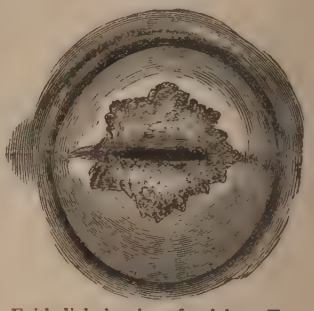
(After Hassall and Tyler Smith.)
Showing loss of epithelium, leaving villi of os uteri bare, and partially eroded.

After all, it may be said, this is a dispute about words. A condition which so closely corresponds to the classical definition of ulceration may fairly be called ulceration. This might be conceded, were it not that the common, vulgar as well as professional, conception of ulceration embraced the idea of a spreading, eroding action; and that thus the word bears a more formidable significance to the patient than the reality justifies. Now, we all know that the morbid surface is not so affected. There is a bared, secreting, easily bleeding surface trying to heal. It is often slow to heal. It may take weeks and months to recover its normal investment of epithelium; but during all this time ulceration cannot be said to go on, otherwise than in the most languid, imperceptible form.

But another process is certainly going on. This is exudation. The gorged vessels, through which their contents are only imperfectly propelled, leave something behind in the tissues. "Exudations," says Druitt (Article "Inflammation," Cooper's "Surgical Dictionary," edition 1872), "cannot remain dormant. They rapidly undergo changes either in the way of development or degeneration." In this case the tendency is towards development. This means hyperplasia and hypertrophy. The connective tissue, or fibrous tissue of the cervix especially, becomes increased in quantity; the cervix becomes after a time denser; it elongates. This latter part of the process, the conversion of exudation into permanent tissue, may be averted by subduing the vascular engorgement, and healing the denuded surface.

The *treatment* of this condition has been described in the preceding remarks. It consists essentially in "rest," tonics, good diet, and local astringents.

Fig. 133.



Epithelial abrasion after labor. Tendency to hypertrophy. (Ad. nat.)

If a cure be not effected at this stage, the case will often become more obstinate. The natural tendency to heal can hardly be trusted to if the powers of the system are sensibly reduced. If there be evident anæmia and attendant impairment of nutrition, repair cannot be expected to proceed in a part exposed to constant disturbances, and periodical fluxes of blood. Generally, the vaginal-portion loses in bulk; some degree of contraction takes place, owing to the absorption of the fluid element of the exuded material, and the condensation of the plastic element ensuing upon its conversion into fibrous tissues. The abraded area looks smaller, and, in fact, is smaller; but this is often not so much the result of actual healing, as of the general contraction of the vaginal-portion. There is still a free secretion of mucus, viscid, coming from the cervical cavity. There is still more or less vascular engorgement, and some infiltration of tissue, with recent exudation. The denuded area looks red, granular, like a strawberry or raspberry. The vagina is still relaxed, and some degree of epithelial shedding goes on from its mucous membrane. The lumbar and dorsal pains persist. There is often pain in the seat of one or other ovary, generally, as Bennet says, in the left.

The *treatment* is still the same as for the earlier stage. The denuded surface should be lightly touched every five or six days with nitrate of silver, and the like application should be made to the interior of the cervical canal. If this cause much pain or bleeding, the solid sulphate of zinc should be substituted. Vaginal lotions of zinc, alum, bark, or tannin should be used daily. If there be any prolapsus, a Hodge pessary will be of essential service in maintaining "rest," and diminishing the local engorgement.

Under this treatment, the denuded surface will often get covered in a few weeks, and the excessive vascularity will be reduced. But exudation has taken place; and exudation has been followed by new growth. This hypertrophy, even although not attended by much increase of bulk, so as to induce prolapsus, or dragging, or pressure upon surrounding organs, is almost always attended by irritation, which keeps up increased attraction of blood, hypertrophy of the glands, and free leucorrhœa. Pain continues to wear the nervous centres. Healthy nutrition is prevented.

At this stage, the application of *potassa cum calce*, or the actual cautery to one or the other lip of the os uteri, will often exert the most beneficial influence.

CHAPTER XXIX.

CONDITIONS MARKED BY ALTERED VASCULARITY OR BLOOD-SUPPLY: FLUXION; HYPERÆMIA; CONGESTION; INFLAMMATION.—*BARNES.*

THE vascular system of the genital organs and the proportion of blood supplied may be in excess or deficiency.

The conditions characterized by excess may be distinguished as —1. *Fluxion or simple determination of blood.* 2. *Hyperæmia.* 3. *Congestion or Engorgement.* 4. *Inflammation.* The conditions characterized by deficiency are summed up in *Anæmia.*

Whilst fluxion, hyperæmia, or congestion may each stop short, inflammation implies the previous existence of fluxion and congestion. It may be regarded as the climax of the first three conditions.

1. *Fluxion* in its simplest form may be defined as a transitory flow of blood to the parts. One example of it may be compared to the rush observed in the cheeks under the emotions of shame or anger. The uterus and ovaries are certainly subject to similar determinations of blood under the influence of various emotions, as the sexual passion, and of reflex irritation, as that produced by the child sucking at the breast. This fluxion is of course perfectly physiological; and, if occurring in healthy organs, entails no ill effects, unless it be artificially and inordinately stimulated.

An example of simple fluxion is the physiological determination of blood excited by ovulation at the menstrual periods.

The vascular fulness determined by the developmental attraction of pregnancy may be regarded as an example of fluxion. Analogous to this is the fulness dependent upon the abnormal developmental attraction produced by the growth in the uterus of fibroid tumors. One difference which exists in the two cases is that, in the first, the fluxion is more uniformly persistent, less disturbed by the periodical molimen of ovulation; it is a steadily maintained, active hyperæmia. In the second, the persistent hyperæmia induced by the developmental stimulus is further liable to the periodical molimen of ovulation. Hence the tendency, where fibroid tumors, polypi, or cancer exist, to metrorrhagia.

Fluxion has its pathological as well as its physiological significance. Using the term in this relation, it takes the place of those states commonly described as "active hyperæmia" and "active congestion." As Billroth observes,* the vessels dilate or suffer themselves to be distended, under the influence of some irritation, and then quickly disgorge themselves when the irritation has ceased. It may be difficult to discover the true cause, but it is generally easy to observe the phenomenon. The exaggerated afflux of blood is the reaction or the response of a vascularized part excited to irritation: "*ubi stimulus ibi fluxus.*"

If the ovaries and uterus be in an abnormal condition, whether from congestion, inflammation, displacement, from being the seat of new formations, their liability to fluxes is increased. The diseased organs will commonly be even more susceptible than the healthy to irritations which provoke the afflux of blood.

If the uterus be imperfectly involved after pregnancy, or engorged, or its tissues relaxed from other causes, this fluxion, otherwise harmless, may give rise to hemorrhages. And it is probable that the hemorrhages so arising act in some cases as an evacuant, saving the uterus from passing into congestion or inflammation.

Fluxion, then, may occur in healthy organs, and in diseased organs. Therefore, when studying the pathology of the ovaries and uterus, we must bear in mind not only their actual or essential morbid conditions, but also the influence, beneficial or injurious, of accesses of fluxion to which they are liable. These fluxions, in fact, form a most important element in the history of uterine and ovarian diseases. They are the immediate occasion of some of the most distressing and dangerous phenomena. By being prepared for them, by moderating their intensity, or by preventing their recurrence, we shall often accomplish the most useful therapeutical results.

It may be doubted whether simple physiological fluxion, howsoever frequently repeated, will often produce inflammation of the uterus, ovaries, or their investing peritoneum. It is true that peritonitis and oophoritis are common in prostitutes, and that these events are attributable to sexual excesses. But it is certain that in many of these cases the determining cause has been the propagation of gonorrhœal inflammation, or exposure to cold or other form of violence.

* "Eléments de Pathologie Chirurgicale Générale," 1868.

CHAPTER XXX.

PHLEGMASIA DOLENS.—*RAMSBOTHAM.*

This is one of the most interesting diseases affecting the puerperal state; not merely from the violence of the attendant symptoms, but also in consequence of the diversity of opinions which have been held respecting its nature and origin. This diversity has led to the introduction of many terms by which it has been described, most of them based on some favorite hypothesis; thus it has been called *œdema dolens*, *œdema lacteum*, *depot du lait*, *metastasis lactis*, and *crural phlebitis*.

History.—The disease is marked by a general and diffused swelling attacking the lower extremity, hard and elastic to the touch, not retaining the impress of the finger, attended with extreme pain, which is much increased when any movement is attempted, or pressure is applied. The surface assumes a glossy white appearance, and the temperature of the limb is greatly heightened. Punctures or incisions through the integuments give exit only to a few drops of very viscid serum, which readily coagulates, and the depending position of the limb increases, but in a slight degree, if at all, the swelling of the foot and ankle.

It usually occurs between the end of the first and fourth weeks after delivery; its accession has been occasionally earlier,—seldom, scarce ever, later. Mr. White, of Manchester,* indeed, informs us, he has known one instance of the disorder showing itself as early as twenty-four hours after delivery, and another as late as five weeks, but he adds, "neither of these are usual;" and Levret† remarks, it has been often observed to take place on the child being weaned, beyond the close of a year. This latter observation, however, has not been borne out by more recent authors; and as Levret had a theory to support by his argument, it is not impossible that his zeal might have betrayed him into error. It attacks one extremity only at the commencement, but sometimes the other becomes affected before the disease has subsided in the first; and in no few instances, as the swelling leaves the one, it shows itself in the other. Blundell,‡ Campbell,§ and Churchill,‖ state that the left side is more frequently affected than the right. White¶ says, "It attacks women who were delivered on the knee, and others who were delivered on the side; but of those who were delivered on the side, it appears that the greater number were affected on that side on which they lay at the time of delivery." It seems, indeed, the general opinion, that the left extremity is more frequently the seat of the complaint than the right; and I have remarked the same in my own practice. White, from the quotation just offered, appears to attribute this peculiar feature of the disease to the position of the body during labor. It may possibly, in some inexplicable manner, be dependent on the different distribution of the right and left spermatic vein,—the right terminating direct in the vena cava, the left in the renal.

Although no puerperal woman is exempt from the chances of an attack, still those of a debilitated constitution, whose system has been broken by a long-continued disease, or who have suffered much from weakening discharges—those also who have gone through a lingering and painful labor, and particularly those in whom profuse uterine hemorrhage has taken place before or after delivery—are by far most frequently the subjects of this affection. A great proportion of the cases which I have myself seen have appeared subsequently to large losses of blood during labor.* Merriman,† when speaking of placental presentations, incidentally mentions that "he has known phlegmasia dolens follow delivery under such circumstances on many occasions." This perfectly accords with my own experience, and I have attributed the accession of the disease rather to the immense discharge which always attends this frightful case, than to any injury inflicted on the uterus under the operation undertaken for the delivery of the child; or to any predisposition connected with such a peculiarity of placental attachment. It is said to have followed an abortion;‡ though I have myself never seen a well-marked instance of such an occurrence. Mr. White§ makes a similar observation. He also says he never knew it to happen to a woman more than once. I have never known it attack the same limb twice; and this is easily accounted for, if the chief vein of the thigh be obliterated. But I have seen some instances where, after a subsequent confinement, pain and *slight* œdematous swelling have occurred in the extremity previously affected with phlegmasia dolens.

If the disease be allowed to run its course, uninterfered with, it will be of uncertain duration. In some instances the patient may be convalescent in a few weeks; in others, and more frequently, many months, or even years, will elapse before recovery is complete. The acute symptoms in such case subside, though the limb continues more or less swollen; and occasionally it has never recovered its former size throughout the remainder of life. As the patient progresses towards convalescence, small, indurated swellings are often observed on the inside of the thigh, calf, and ham; these have been regarded as enlarged glands, but they are now generally supposed to consist of effused lymph; and in no few instances the superficial veins of the leg and thigh, with those on the lower part of the abdomen, have become much enlarged as the acuteness of the complaint has subsided; and have continued varicose for many months. A fatal termination is comparatively rare; but patients have sunk under the violence of the febrile paroxysms, from mere debility, from gangrene in the affected limb or other parts, and in some few instances from suppuration. I have never known an abscess formed in the cellular structure of the diseased leg. White‖ also states that he never knew it suppurate; but Haighton¶ observed a succession of abscesses in the limb; and

* An Inquiry into the Nature and Cause of that Swelling in one or both of the Lower Extremities, which sometimes happens to Lying-in Women. Second edition, 1792, p. 9. The first edition of this treatise was published in 1784.

† L'Art des Accouchemens, 1761, p. 168. ‡ Obstetricy, by Castle, p. 786.

§ System of Mid., 1833, p. 371. ‖ Midwifery, 1842, p. 462. ¶ Op. cit., p. 11.

* "In several cases we have witnessed it to follow severe and extensive uterine hemorrhages; and were we to decide from our own experience as to the frequency of its occurrence after any one condition of the system, we should say it was more apt to follow severe uterine losses of blood, than any other single cause." Dewees, Diseases of Females, Philadelphia, 1833, p. 492. "Phlegmasia dolens frequently occurs in exhausted states of the constitution from hemorrhages and long-protracted fevers."—Davis, Med. Chirurg. Trans., vol. xv., p. 455.

† On Difficult Parturition, 1820, p. 126.

‡ Denman, chap. xix., sect. 3; Burns' Principles of Mid., 1820, p. 541; Dewees, Diseases of Females, p. 471, who says he has seen two instances.

§ Op. cit., p. 11.

‖ Ibid. ¶ Blundell, by Castle, p. 788.

Hull* speaks of it as terminating occasionally in the same manner. Pus has been found by various observers in the hypogastric and uterine veins, in the pelvic cavity, and in the structure of the uterus itself.† In one case which terminated fatally under my care, the whole integuments of the calf sloughed, and the gangrenous disposition seemed to arise principally from distension.‡ The leg had acquired a size almost equal to the circumference of the woman's body; the skin of the calf cracked in various places; these points became sloughy, enlarged, and coalesced, and death rapidly followed.

Phlegmasia dolens is by no means confined to puerperal women, nor, indeed, entirely to females; a disease, at least attended with all its peculiarities and characteristic symptoms, and dependent on the same immediate cause, has frequently been observed in women, consequent on the sudden suppression of the menstrual secretion, and accompanying malignant disease of the womb.§ In the male sex it has been known to attend on dysentery, to follow diarrhœa when ulceration of the intestines and disease in the hæmorrhoidal veins existed, and to supervene on cancer of the rectum.‖ It has also originated in external injuries—a blow on the shin has produced it; it has followed ulceration of the leg—operations, especially on the veins—and the local exposure of the limb to cold. Mr. Tyre, of Gloucester,¶ mentions that he has seen a disease, with all the features of phlegmasia dolens, appear in a person who had suffered greatly from retention of urine and inflammation of the bladder. In one instance I knew it appear a short time before death, when there was a skirrhous prostate and diseased bladder; and both White** and Hewson†† speak of a disease similar to phlegmasia dolens occurring independently of the puerperal state. The latter physiologist, indeed, cites two cases, in which it seemed consequent on suppressed menstruation, but "where there was no other symptom of ill health." Dr. Tweedie‡‡ has treated many cases of a disease similar to that under consideration, which occurred "during the progress of, or convalescence from fever," at the London Fever Hospital. All the patients, except one, were females; the complaint in all attacked one of the lower extremities only; and in all active depletion had been employed in the treatment of the precursory fever; and Dr. Cheyne§§ has noticed, among the sequelæ of fever, "an affection not confined to the female sex, resembling phlegmasia dolens." Nor is its seat confined to the lower extremities; the arms have become affected both in men and women, particularly, however, in females suffering from carcinoma of the breast; under which circumstances I have myself seen it. Dr. Ferriar‖‖ observed it in the arm of a male; and Dewees¶¶ also saw it attack the arm of an elderly gentleman whose shoulder had been much injured by the overturning of a coach. I deem it unnecessary to multiply examples, which might easily be done.

Proximate cause.—The phenomena attendant on phlegmasia dolens have been referred to many causes: it has, however, generally been attributed to inflammation of some of the tissues of the affected limb. Mauriceau,*** indeed, the first author who makes any particular mention of the disease (for the vague accounts in all previous writers are highly unsatisfactory), thought it originated in a retention of those humors which should flow away with the lochia, and their reflux upon the extremity. He evidently felt a hardened cord at the upper part of the thigh, but considered it the nerve. This hypothesis was generally followed till the middle of the last century, when Puzos* and Levret† gave its history and their opinions of its immediate cause. These physicians considered that it depended on a metastasis of milk from the breasts to the legs. Mr. White believed that "the proximate cause was an obstruction, detention, and accumulation of lymph in the limb; that the disorder was local, and had a local cause; that the obstruction was occasioned by some accident happening during the time of labor, or some state peculiar to child-bed;" and that this accident consists in one or more lymphatic vessels being pressed upon by the child's head during labor, to such an extent "as to stop the progress of the lymph; so that the vessel, being surcharged, must at last burst, and shed its contents." He goes on to say, "that in some constitutions the lymph which escapes out of the orifice will be absorbed again without creating any disturbance in the system;" while in others this fortunate occurrence will not take place, but the peculiar symptoms will develop themselves, and "the lymph, though a very innocent fluid, when circulating within its own vessels, may become much otherwise when stagnating out of them."

Mr. Tyre considered the proximate cause to be *inflammation* of the femoral and inguinal *lymphatic glands*, occasioned by pressure during labor, by the absorption of acrimonious discharges from the vagina, or by inflammatory action commencing in a lymphatic vessel and spreading upwards to its proper gland; and he supposes that the enlargement and induration of the gland prevent the passage of the fluid through it, and cause its effusion into the cellular structure of the limb.

Dr. Ferriar looked upon the disease as seated in the absorbent system, and considered it inflammatory. Denman‡ thought that "the glands and lymphatics of the limb were evidently the parts first and principally affected." But from his recommending stimulants and opium, even at the onset of the complaint, we cannot suppose that he regarded it as originating in inflammation. Caspar's§ opinion is, that it consists in inflammation of the absorbents; with, in some cases, a simultaneous affection of the cellular tissue; and Dewees,‖ that it is "inflammation of the white lymphatic vessels of the cellular membrane of the several textures of the limb." Dr. Hull¶ could not believe that the lymphatics alone were affected, and considered that the proximate cause consists in "inflammation of the muscles, cellular membrane, and inferior surface of the cutis, extending in some cases, perhaps, to the large blood-vessels, nerves, lymphatics, and glands;" and that, in consequence of this diffused excitement, serum and coagulable lymph were suddenly thrown out into the cellular texture. Although, according to this (to use the significant phrase of Dr. Davis) *capacious* theory of Dr. Hull's, the phenomena were attributed to inflammatory action, still we are left in the dark as to what excited this inflammation *ab initio*, or in what particular part the disposition first showed itself.

It has been attempted, of late years, to clear up this difficulty; and to my late colleague, Dr. David Davis, we are indebted for establishing, I think on pretty sure grounds, the theory that the *venous system* is the part first affected. He read an essay, in May, 1823, before the Medico-Chirurgical Society,** in which he contended that phlegmasia dolens depended on inflammation in the iliac and femoral veins. Four months, indeed, before this date, M. Bouillard had related some cases in the *Archives de Medicine*,†† which demonstrated that the femoral veins were diseased to a considerable extent, and their canals wholly or partially obliterated. He stated, in terms not to be misunderstood, that he looked upon an obstruction in these veins as the cause of the affection. Not-

* Essay on Phlegmasia Dolens, 1800, p. 139. See also Tyre, p. 64.

† Lee, on the most important Diseases of Women, 1833, cases 38, 39, 41, etc.

‡ For a similar case see Hevin's Cour de Path. et de Ther. Chirurg.

§ Lee, Op. cit., p. 152, *et seq.* See also a case by Dr. A. T. Thomson, of well-marked phleg. dolens occurring in a woman, æt. 22, without any symptoms of uterine disease, in Lancet, July 6th, 1839, p. 538.

‖ Lee, p. 163.

¶ Essay on the Swelling of the Lower Extremities, incident to Lying-in-Women, by Charles Brandon Tyre, 1792, p. 45. ** Page 55.

†† Exp. Inq., part ii., p. 197. ‡‡ Ed. Med. Jour., vol. xxx., p. 258.

§§ Report of the Hardwicke Fever Hospital.

‖‖ Med. Hist., vol. iii., p. 92. ¶¶ Diseases of Females, p. 471.

*** Paris, 1721, 4to. livre iii., chap. xx., p. 446.

* Memoire sur les dépôts laiteux, 1759. M. Puzos died in 1753, and this memoir was published, together with his other works, by M. Deslandes, in the year stated.

† L'Art des Accouchemens, chap. iii., sect. 7.

‡ Op. et loc. cit.

§ Comment. de Phlegmasia alba dolente, Hallæ, 1819.

‖ Diseases of Females, p. 490.

¶ An Essay on Phlegmasia Dolens, Manchester, 1800.

** Vol. xii., p. 419, 1823.

†† Tom. ii., p. 192, January, 1823.

withstanding the priority of publication must be conceded to Bouillard, there is no question that the view which Dr. Davis took of the disease originated entirely with himself; for a dissection of one of his patients, performed by Mr. Lawrence, so early as the year 1817, first seems to have called his attention to the subject, and I know his opinions were broadly stated by him long before his paper was submitted to the society. Dr. Robert Lee* has even gone a step farther than Dr. Davis: he has applied himself towards elucidating the morbid anatomy and pathology of the disease, with his usual perseverance; and he has not only confirmed all that Dr. Davis had previously advanced, but has even traced the inflammation extending into the uterine branches of the hypogastric veins. He presumes it originates in these latter vessels, and, spreading into the common iliac, external iliac, and crural veins, produces all the subsequent symptoms; and he accounts for the comparative frequency of the affection in the puerperal state, because the orifices of the uterine veins, being opened on the separation of the placenta, a communication is indirectly established between the venous system and the atmospheric air, in a manner somewhat analogous to what takes place in amputations, and other extensive wounds.† Velpeau‡ adopts the conclusion that this acute swelling of the limb may be ascribed, in some instances at least, to inflammation of the pelvic symphyses, as well as of the veins. Campbell§ considers it "an effusion of lymph into the cellular membrane, in consequence of the obstruction experienced by the venous blood in its transit from the limb towards the heart." While Rigby‖ states the proximate cause to be "obliteration of the lymphatics, whether from inflammation of the adjoining vein, or of the layer of cellular tissue through which they pass;" and says, "As it is almost invariably preceded by symptoms of puerperal fever, many of its early symptoms will differ but little from that disease."¶ In this latter remark, Dr. Rigby follows Hull,**Le Gallois, Busch, and Ferguson;†† but with it I can by no means coincide; for although this disease is usually attended with some uterine irritation, and even though it originate in inflammation of the uterine veins, it is certainly neither preceded commonly, nor accompanied by that train of morbid phenomena which are generally regarded as characteristic of puerperal fever. Besides which, the commencement of the attack is generally later after delivery than that of puerperal fever; and I cannot regard the cases published, which are supposed to prove the identity of the two diseases, as cases of genuine phlegmasia dolens.‡‡ My own opinion is, that the immediate cause of the swelling of the limb is inflammation and obliteration of the crural vein; which may have commenced in the uterine sinuses, and have travelled along the uterine vein, the common and external iliac; or which may have originated in either the crural or the iliac vein itself.

This inflammation may perhaps be confined to the cellular tissues, and the middle coat of the vein, terminating in the effusion of solid lymph into the structure of the vessel; or the internal coat may be implicated; and successive layers of coagulable lymph may be deposited on its inner surface. The accumulation of solid matter thus secreted, aided by the thickening of the middle and external coats, and the coagulation of the blood contained within it, may gradually block up the cavity, and convert into a solid cord what was originally a pervious canal.

If the inflammatory action commences in the internal membrane, and its violence is so great as to terminate in the formation of pus, the puriform matter will mix with the blood, poison the system, and give rise to that train of symptoms consequent on such a deterioration of the vital fluids; but if, instead, solid lymph is deposited, those phenomena will be developed which constitute phlegmasia dolens.

Morbid Appearances after Death.—The state of the parts after death exhibits various appearances, according to the violence of the disease, the length of its duration, and whether itself has produced the fatal termination, or the patient has fallen a victim to some other morbid actions. Little or no serum has generally exuded from the extremity on incisions being made. The crural and iliac veins have sometimes, when the attack was remote, been found perfectly obliterated, having been converted into ligamentous cords by lymph effused into their tunics, and having become strongly adherent to the sheath and cellular substance enveloping them. In more recent cases, the vessels have been diminished in capacity by a thickening of their coats, and the formation of an adventitious membrane adhering firmly to their internal surfaces; strong, solid, deep-colored coagula have also in most instances been observed, distending the canals, under such a state of inflammation; and the lining membrane has been of a dusky-red or bright-scarlet hue. The uterine plexus of veins, too, has generally been blocked up with firm, red coagula. The vena cava has in some instances partaken more or less of the peculiar appearances evident in the iliac veins. The iliac glands have sometimes been observed converted into abscesses, or enlarged and inflamed; collections of pus have been found in the cellular structure of the pelvic cavity, or in the substance of the uterus; and in such cases, independently of a narrowing of their canals, and other marks of inflammatory action, pus has been found in the hypogastric, common iliac, and femoral veins. In two cases of death which came under my own care, the veins of the pelvis and thigh were extremely diseased: in that already alluded to, where sloughing occurred, the internal iliac and femoral were obliterated, and converted into a ligamentous tissue; in the other, the cellular substance surrounding the hypogastric was inflamed and thickened, and the canal rendered totally or nearly impervious by a thick plug of whitish fibrine: the same appearances showed themselves also in some of its communicating branches.*

It would appear probable (knowing, as we do, the frequent fatality attendant on the internal coat of the vein becoming inflamed to the extent of secreting pus, which mixes with the blood) that such an event is rare under ordinary phlegmasia dolens, and that the inflammatory affection is principally seated in the cellular and middle tunics; and this idea is strengthened by the dissections just alluded to, as well as others which have occurred to myself.†

Symptoms.—The symptoms of this disease have already been glanced at, while treating of the history. It is usually ushered in by shivering, mostly of an aggravated character; to the rigor succeeds deep-seated pain in the hypogastrium and loins, which is soon referred to one or other groin. In the course of a few hours, swelling takes place—the upper part of the thigh being generally first affected—and the intumescence travels rapidly downwards. More rarely, the calf swells before any other part, the regions above and below quickly participating, until the whole limb, from the groin to the toe, is increased very considerably in circumference. As the disease advances, the labium pudendi and buttock of the diseased side generally assume the same morbid appearance. The swelling is of a peculiar character; it is hard, elastic, and although it yields somewhat to the impress of the finger, no pit or indentation is left when the pressure is removed. Its surface is white and shining (which is attributable to the distension the cuticle suffers), and the temperature of the whole member is much augmented. It is seldom in the early stage that any perspiration is visible on the skin of the affected limb. As soon as the least enlargement takes place, a firm, exquisitely painful cord may usually

* Op. cit., p. 116. † Med. Chirurg. Trans., vol. xv., p. 400.

‡ Researches et Observations sur le Phlegmasia alba Dolens. Archives generales de Medicine, tom. vi., 1824.

§ Mid., p. 370. ‖ Lib. of Mid., vol. vi., p. 300.

¶ Page 296. ** Op. cit., pp. 227–235.

†† Diseases of Women, part i., p. 29, who considers it "only puerperal fever, modified by its locality."

‡‡ See Ferguson, op. cit., pp. 245–247.

* I would refer my readers to the 15th vol. of the Med. Chirurg. Trans. for two plates illustrative of the disease in question being dependent on inflammation and obliteration of the crural veins; as well as to Dr. Hope's work on Morbid Anatomy for another; taken from cases which occurred in Dr. Lee's practice.

† See a good paper on phlegmasia dolens, by Mr. Anderson of Manchester; read before the Manchester Med. Soc., and transcribed into the Lond. Med. Gazette, March 7, 1835; in which he expresses an opinion, in my judgment a right one, that the disease is essentially phlebitis; but that the inflammation exists in the proper and outer tunics of the vein, the inner only being affected, to the formation of pus, in those cases where typhoid symptoms show themselves.

be detected, running downwards from the upper part of the thigh; which has been mistaken for the nerve, and also for inflamed absorbents, but which recent dissections have satisfactorily demonstrated to consist of the indurated and thickened femoral vein. In some instances, though comparatively rarely, the inguinal glands may be felt enlarged. Acute pain in the limb precedes and attends its increase in size, very much aggravated by pressure, especially in the ham and along the course of the femoral vein; so that often the gentlest touch can scarcely be borne. Any change in the position of the extremity is also attended with increased suffering; and the patient is incapacitated from moving it of her own will, not only in consequence of the agony such an attempt occasions, but also from actual loss of power over the muscles themselves. The most easy posture is with the limb flexed both at the hip and knee joints, the trunk being turned a little towards the disabled side.

If the patient is progressing favorably, the violence of the pain gradually abates; it becomes of a dull, heavy, and gnawing kind, or the limb is more or less benumbed, while it still continues enlarged and hard. In process of time, however, the solidity disappears, the skin over the tibia, as also the instep and ankle, begin to "pit on pressure," and the whole member assumes the character of common œdema. I consider this softening one of the best local symptoms that can appear.

Such an extensive disease cannot be expected to exist in any part of the body without very considerable general derangement. The pulse is very quick and feeble, often mounting to 130 or 140; the countenance pale, leucophlegmatic, and expressive of distress; the tongue furred and moist; the bowels mostly constipated; the urine scanty and turbid: there is thirst, headache, want of sleep, and other indications of pyrexia, varying in degree; occasionally vomiting; and the febrile affection sometimes puts on an irregular, remittent, or intermittent form. Sometimes excessive perspiration over the whole body is observed from the very commencement, which tends to weaken the patient most materially. The lochia are generally suppressed; or, if still flowing, become changed and fœtid in character. Should, however, the disease not make its appearance till nearly a fortnight after delivery, which is, perhaps, the most usual time, the lochial discharge will have almost entirely ceased to flow previously to the attack. As the pain abates, the febrile symptoms also disappear; and excessive languor and debility supervene. Should suppuration or gangrene take place, the accompanying fever assumes the typhoid type, and the patient will most probably sink under her protracted sufferings.

Diagnosis.—This affection may be distinguished from œdema by the hardness, pain, and fever attending it, and by its not showing itself till some time after delivery.

Prognosis.—Our prognosis may, in the great majority of cases, be favorable, and should be regulated partly by the size the limb has attained, but principally by the violence of the febrile paroxysms. The disease seems to bear a more dangerous character now than formerly; for Mr. White tells us he never saw it terminate fatally; and in another passage he says, it will be difficult to determine the remote cause until proved by dissection; "and it may be a long time before such an opportunity offers, as this disorder has *never been known* to prove fatal."* This difference, indeed, with regard to the termination, induced the learned editor of the Medico-Chirurgical Review† to withhold his assent from Drs. Lee and Davis' opinions, and to consider that the cases which came under their observation (where death occurred, and dissection proved the changes that had taken place in the veins) were not true specimens of the disease, as ascribed by Hull, White, and other observers. Denman, however, mentions that he had seen one instance, and heard of several others, in which a fatal termination occurred, where no other cause of death could be assigned or suspected; but he seems to attribute the event to extraordinary exertions which the patients were urged to make; for they sunk either under some great effort, or immediately after.‡

*Op cit., p. 43. †Vol. xxiv., p. 469, 1836. ‡Chap. xix., sect. 3.

Treatment.—As the disease originates in local inflammation of an acute kind, we might perhaps be inclined to have recourse to free depletion for its cure; but as, on the other hand, it generally attacks a frame previously debilitated, either by long-continued indisposition, the loss of blood, or some other depressing action, there are but few cases in which, even at the onset, we should dare to take blood largely from the arm; and we shall find more advantage from the application of sixteen or twenty leeches to the hypogastrium, the groin, and the upper part of the thigh, on the first accession of pain, whether the swelling has commenced or not. I have myself seen many instances in which I am persuaded phlegmasia dolens was arrested at its commencement by free leeching being promptly had recourse to.*

But we need not trust to the agency of leeches alone, although we may think it necessary to repeat them. We must also procure early evacuations from the bowels; though we shall find powerful cathartics generally injurious. Small doses of calomel, or other mercurial preparations, combined with antimony or Dover's powder, and mild purgatives, are of much benefit. It is of the utmost importance that we should procure ease and sleep, and that we should act, if possible, on the liver, the kidneys, and the skin. Warm anodyne fomentations to the limb will often be useful, or a tepid spirituous lotion; but I think more relief is obtained by wrapping it in a fold of new flannel, and enveloping the whole in oiled silk, which seems to be beneficial by exciting local cutaneous perspiration. Professor Jennings, of Baltimore,† recommends, from experience, strips of adhesive plaster, spread with mercurial ointment, to be applied over the whole limb; these he covers with pieces of oiled silk neatly fitted, and a bandage sufficiently tight to keep the dressings close, but not to give pain.

When the affection has existed some days, and the pain still continues, advantage may be gained by four or six leeches, every second or third day, applied in the track of the femoral and popliteal veins, and the local vapor bath, in addition to the other means just devised. And in its more chronic stage, when the pain and venous inflammation have entirely subsided, frictions, with or without stimulant embrocations, and a properly adapted bandage, are of essential service. I need scarcely insist on the leg being preserved, as much as possible, from the dependent posture, until recovery is complete. Mr. White found blisters to the upper part of the thigh and groin useful. Mercurial frictions, digitalis, and iodine, seem injurious rather than beneficial. On the whole, when extensive tumefaction has taken place, we may consider the case very much removed beyond the immediate power of medicinal agents; and for the purpose of effecting a cure artificially, we should depend principally on local abstraction of blood at the very onset of the disorder.

* In the middle of July, 1831, I attended a lady of her first child, whose labor was very lingering, and frightfully painful, in consequence of a narrowness of the pelvis throughout its whole extent. The child was born dead. Early on the third morning she was attacked with rigor, followed by uterine inflammation, which, however, was soon subdued; and in a fortnight she was well enough to be walking about her chamber. On the seventeenth day after her delivery, her husband returned home unexpectedly early; she ran out of the room to meet him, and, as the weather was excessively oppressive, sat in the ante-room with him for some time, never before having left her bed-chamber since her confinement. Late the same evening she was seized with acute pain in the left iliac region, attended with stiffness, weight, and dragging at the groin, an almost entire inability to move the limb, and all the incipient symptoms of phlegmasia dolens. When I saw her early the next morning, she was suffering exceedingly; all the neighborhood of the left groin was exquisitely tender, and, as well as the upper part of the thigh, was slightly swollen. Pressure produced so much pain, that I was deterred from examining accurately, to ascertain whether the vein was distinguishable. A number of leeches were immediately applied, which bled so profusely as to cause three or four attacks of perfect syncope, and greatly to alarm her attendants. The pain was removed, but phlegmasia dolens appeared in a well-marked, though exceedingly mitigated, form, and confined her to her chamber another month; nor did the swelling, hardness, and stiffness, disappear for many weeks afterwards. I have no doubt that the large local loss of blood saved her from a protracted and, perhaps, a fatal disease.

† United States Med. and Surg. Journal, Oct., 1835.

CHAPTER XXXI.

IMPERFORATE HYMEN.—*ISAAC BAKER BROWN.*

In its natural state, the virgin hymen closes the vagina imperfectly, generally occupying the inferior portion of the ostium vagina in the form of a semilunar membrane, leaving an aperture in the upper portion from the size of a quill to that of a thimble, for the transmission of the menstrual fluid. But it occasionally happens that the membrane is congenitally entire or imperforate. This may not be discovered until puberty, when the patient will suffer severely every month by the accumulation of the menstrual secretion within the vagina, producing ultimately a pelvic tumor and a bulging out of the membrane which closes the vagina, causing severe pain and other serious symptoms. In this case, the uterus as well as the vagina, and even the Fallopian tubes, become distended with the menstrual fluid, which, increasing in quantity at every menstrual period, presents at length an urgent necessity for an operation. The method of relieving this condition has been to divide the hymen by a crucial incision, and the fluid having been discharged, generally nearly black in color, and of the consistence of treacle, the uterus is well syringed out with warm water and a bandage applied around the abdomen.

This appears very simple and easy. Yet many young women have lost their lives by this operation from consequent peritonitis; and the subject is one which is worthy of careful investigation.

'The fatality of this operation has been ascribed by Dr. Blundell to the epidemic influence of puerperal fever, then raging in the neighborhood. His opinion is worthy of great respect: I therefore quote his words. He says: "It seems that where puerperal fever is epidemic, women in whom the hymen has been divided in this manner are liable to inflammation of the peritoneum afterwards, in the same way as they are liable to similar inflammation after they have been recently delivered. Cases of this kind, two in number, if my memory serve, have been mentioned by Denman; and a few years ago, at the London Hospital, a case occurred, for a reference to which I was indebted to Mr. Mitchell, of Kennington. In this case, the accumulation of the catamenia amounted to two gallons or more. The obstruction was divided; inflammation of the peritoneum ensued, but the patient was saved by rigorous antiphlogistic remedies. As this is the case, if I had a patient under my care, I should dissuade her from submitting to the operation till the epidemic disposition to puerperal fever had subsided: even though she waited for three or four years; for, without pretending to assert that abdominal inflammation from this cause is equally dangerous with the genuine fever of puerperal women, I think it not impossible that it might cost her her life. Is there any analogy between the lochia and the catamenia, and is this the cause of these similar effects? Perhaps some great pathological truth lies concealed here." *

Without for one moment questioning the propriety of deferring this, or any other operation upon the pelvic or abdominal organs, whenever and wherever puerperal fever is epidemic, I have a strong impression that fatal peritonitis has succeeded this operation when there was no such influence to account for it. At all events, many such cases are recorded without any reference being made to the existence of an epidemic puerperal fever.

Treatment.—When the surgeon is consulted in the case of a young female before the age of puberty, on account of an occlusion of the vagina, it will generally be found that the united parts may be separated by the thumb of each hand being applied, and some little force being used, the child being placed in the lithotomy position. Cutting is rarely required in children. A piece of oiled lint should be introduced to prevent reunion of separated parts, after they have been thus torn asunder. If the obstruction is of a longer standing, and the tissues are thickened and indurated, then the question to be considered is, how is it to be divided? Every author who has written on the subject recommends a crucial or stellate incision. This leaves the divided portions of the hymen to retract and remain on each side of the vaginal orifice; and when the operation is performed in the earlier stage, before puberty, or a few years afterwards, these relics of the thickened hymen may create no irritation of consequence; not so, however, when the patient has passed her 25th or 30th year; the divided portions do not then shrivel or pucker up, so as to create no inconvenience. On the contrary, vaginitis is very apt to be set up by the friction of these surfaces upon each other, produced by every movement of the body. It is easy to understand how inflammation thus set up in the mucous membrane of the vagina may extend into the uterus, Fallopian tubes, and ultimately to the peritoneum. I would therefore throw out the question, whether the frequent occurrence of peritonitis after this operation, simple as it appears to be, may not thus be explained.

Being strongly convinced that these two methods of dividing the hymen, namely, by the crucial and stellate incision, attended as they are by so many inconveniences, and, as I believe, dangers, are not so eligible as a more perfect surgical procedure, by which the whole of the abnormal structure is at once removed, I recommend that the hymen be removed entire by a circular incision at the point of its junction with the labia.

[The patient being etherized is placed upon her back, the legs flexed by the two assistants, who, with their free hands, retract the labia while the operator removes, with the curved scissors, the entire hymen. There will be no hemorrhage of any consequence, and the parts should be dressed with lint soaked in carbolic acid and olive oil, one part to thirty, for a week or ten days.—G.]

* Blundell's "Midwifery," p. 689.

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